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ELEMENTS OF

MATERIA MEDICA

AND

THERAPEUTICS

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CINCHONA CALISAVA (*see page* 290)

MAY 25 1892

ELEMENTS OF MATERIA MEDICA AND THERAPEUTICS

INCLUDING THE WHOLE OF THE REMEDIES OF THE BRITISH PHARMACOPŒIA OF 1885 AND ITS APPENDIX OF 1890

BY

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WITH 440 ILLUSTRATIONS

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PREFACE

In the following pages will be found such remedies as are contained in the edition of the British Pharmacopœia which was issued in 1885, together with those of the Appendix of 1890, so that the work treats only of the drugs that are *official*. A few illustrations of non-official plants have, however, been introduced here and there, in order to demonstrate some particular botanical facts. The book has been divided into two principal sections, viz., Inorganic and Organic. The organic part deals exclusively with the vegetable and animal products ; but under the inorganic heading will be found the alcoholic and ethereal preparations, and such bodies as creasote, paraffin, etc. Thus under Carbon will be found the compounds of this elementary substance with oxygen, hydrogen, etc.

Many excellent treatises upon Materia Medica are in existence, but, with few exceptions, such as Bentley's "Text Book of Organic Materia Medica," and Royle and Headland's "Manual of Materia Medica and Therapeutics," no illustrated volume has appeared since the publication of Pereira's "Elements," now some twenty years ago.

It can scarcely be denied that in such a work as the present one illustrations must prove serviceable in rendering the subject more interesting and in tending to impress the facts more firmly upon the memory ; and I take this opportunity of expressing my thanks to the publishers for the kind manner in which they have placed so many admirable blocks at my service.

In the description of the various preparations and their mode of preparation, the exact details, in many instances, have been omitted, as have also the absolute amounts of the ingre-

dients employed ; this part of the subject belongs especially to the realm of Pharmacy, and will be found treated at considerable length in my "Aids to Pharmacy," which volume, I venture to suggest, will form a useful companion to the present work.

With respect to the vegetable substances, the arrangement adopted by Sir A. B. Garrod has been retained throughout ; but I must mention that Bentley, in his "Organic Materia Medica," presents some deviations from this arrangement in his classification. In the preface to this work he says : "It will be noticed that the arrangement of the plants from which the vegetable drugs are derived is different in many respects from that ordinarily adopted in works upon Materia Medica. This arrangement is founded, so far as the Phanerogamia or flowering plants are concerned, upon that adopted by Bentham and Hooker in their 'Genera Plantarum,' a work which cannot fail to be the standard authority on the subject for many years to come, and the arrangement there adopted must consequently, in this country at least, come into general use."

The important alterations in Bentley's classification are the following, viz. : the Lemon, Orange, and Bael are placed under the natural order Rutaceæ ; Coca under Linaceæ ; Podophyllum under Berberidaceæ ; Storax under Hamamelidaceæ ; Tobacco, Stramonium, Belladonna, and Hyoscyamus under Solanaceæ ; the Cinchonas and Catechu under Rubiaceæ ; and Ergot under Fungi. Isinglass is also placed under a class termed Sturiones.

In the compilation of the following pages, although I have embodied many of my own observations, I have been careful to consult the most esteemed authorities upon the subject and to bring the work entirely up to date, in order to meet the requirements of the present day.

C. E. Armand Semple.

8 Torrington Square, W.C.
March 1892.

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ELEMENTS OF MATERIA MEDICA AND THERAPEUTICS

INORGANIC SUBSTANCES.

OXYGEN. O = 16.

This gas is obtained by heating the red oxide of mercury and by various other methods. It is colourless, heavier than air, forms about $\frac{1}{5}$ of the air we breathe, and is slightly soluble in water ; the great supporter of combustion.

Therapeutics.—A solution of oxygen in water has been used as a slight stimulant and excitant. Inhalation of the gas has been tried in certain conditions of the system associated with deficient aëration of the blood, but without much success.

HYDROGEN. H = 1.

This gas is obtained by the action of diluted sulphuric acid upon certain metals, such as zinc and iron. It is colourless, lighter than air, and inflammable.

Therapeutics.—Hydrogen is of little value as a remedial agent ; when mixed with a certain quantity of oxygen and breathed, it imparts a peculiar shrill and sharp tone to the voice. A *flame of hydrogen* has been used as a cautery to form issues, but otherwise it is not employed therapeutically.

WATER. $H_2O = 18$.

This substance should be free from taste, odour, or visible impurity.

The water in common use is derived from springs, rivers, and rainfall. Rain-water, if collected before it touches the earth, is very pure and soft; but when it falls upon limestone or chalky districts it is liable to become impregnated with sulphate and carbonate of calcium, and occasionally with the salts of magnesium.

The purity of spring and river waters entirely depends upon the soil out of which they rise or through which they pass. Spring-water is often rendered "*hard*" from its containing compounds of calcium.

Purification.—The chief methods for purifying common water are the following:

1. *Subsidence.*—The water is left at complete rest, so that the suspended impurities may gradually subside.

2. *Ebullition.*—By this means vegetable or animal vitality is destroyed, air and carbonic anhydride are expelled, and carbonate of calcium is precipitated.

3. *Filtration.*—This process renders water clear and transparent. The substances used for the filtration of water are charcoal (both vegetable and animal; the latter is the more effective), perforated plates of metal, flannel, cloth, sponge, porous stone, and beds of sand. Paper is made use of only in operations on a small scale. There are two kinds of filtering-paper: the *fine*, for removing finely divided matter; the *coarse*, for the separation of the grosser particles.

4. *Distillation.*—This is the most effectual method, when properly conducted; but distilled water frequently contains traces of organic matter.

MINERAL WATERS.

These are divided into four classes:

A. **Chalybeate** or **Ferruginous Waters.** Contain iron in the form of carbonate and sulphate. Carbonate of iron is found

in the waters of Pyrmont, Spa, Schwalbach, Tunbridge Wells, and Harrogate. Sulphate of iron occurs in the waters of Sand Rock, Isle of Wight, Brighton, &c.

Therapeutically, the chalybeate waters are useful in conditions of anæmia and debility ; they should always be avoided by plethoric persons.

B. **Acidulous** or **Carbonated Waters.** Contain much carbonic acid, giving slight acidity and causing sparkling. Their chief salts are carbonate of iron, carbonate of sodium, and carbonate of magnesium, with excess of carbonic acid. The chief of these waters are those of Carlsbad, Seltzer, and Ilkestone, near Nottingham.

Therapeutically, the carbonated waters are useful in atonic dyspepsia ; they increase the secretion of the kidneys and skin, and are valuable in rheumatism, gout, and some calculous affections.

C. **Saline Waters** These may be subdivided into—

1. *Purging Saline Waters*, as those of Cheltenham, Leamington, Purton, Seidlitz, Pullna, and Friedrichshall bitter waters. They chiefly contain sulphates of magnesium and sodium.

2. *Calcareous Waters*, as those of Buxton, Bath, and Bristol, containing principally carbonate and sulphate of calcium.

3. *Salt Waters*, as those of Wiesbaden, Baden-Baden, and Kreutznach, chiefly containing chlorides, the last yielding considerable quantities of iodine and bromine.

4. *Alkaline Waters*, as those of Vichy and Ems, in which a large amount of alkaline carbonates is contained.

Therapeutically these waters are useful in congestion of the portal system. They are powerfully stimulant and alterative, and the alkaline waters are specially indicated in an acid condition of the urine.

D. **Sulphuretted** or **Hepatic Waters** contain sulphuretted hydrogen in solution, and are recognised by their odour. They are found principally at Harrogate, Moffat, Cheltenham, Aix-la-Chapelle, Borcel, and Aix in Savoy.

Therapeutically sulphuretted waters are stimulants, espe-

cially to the skin and uterine system, and they are much used in skin diseases of a chronic character.

Therapeutics of water.—Water is used both cold and hot; as aqueous vapour and as ice.

Injections of cold water are thrown into the *rectum* to stay hæmorrhage, expel worms, and relieve pain in hæmorrhoids, and into the *vagina* to arrest uterine hæmorrhage.

The **Cold Bath** is employed to obtain a nervous impression, *shock*, and subsequent glow, with the object of increasing the tone and vigour of the body. In pregnancy and in diseases of the heart it is a dangerous remedy, as also in persons disposed to apoplexy, and in those in whom it is followed for a long period by coldness of surface, blueness of lips, feeble pulse, and headache. The *temperature* of this bath ranges from 1° C. to about 23·8° C. (33° F. to about 75° F.); when below 10° C. (50° F.) it is regarded as very cold.

Perfusio, or **Cold Affusion**, has been recommended in some affections of the head. This term implies the pouring of cold water from a greater or less height upon the head of the patient. The *temperature* should be between 0° C. and 13·3° C. (32° F. and 60° F.) This form of application is advantageous in syncope; in prussic acid, alcohol, or opium poisoning; in epilepsy, fainting, and hysteria; in asphyxia from inhalation of carbonic acid, or sulphuretted hydrogen; and in the convulsive fits of children.

The internal administration of cold water will sometimes alleviate gastric pain, spasm, and hiccough, and large draughts of it have caused the expulsion of intestinal worms.

The **Impluvium**, or shower-bath, is similar to, though milder than, affusion. In insanity it is very useful for allaying mental excitement. Cold or tepid *washes* may be used in febrile diseases with the best results. The so-called *water-dressing* may be regarded as an improved form of poultice; it is used in the form of two or three layers of lint dipped in water and applied to inflamed parts, wounds, or ulcers, the whole being covered with oiled silk.

Ice is used externally for checking hæmorrhage, especially in operations for piles and fistula; it has also been found

serviceable in restraining discharges of blood from the uterus. The *Ice-Cap* (made by placing pounded ice in a bladder) is applied to the head in inflammation of the brain ; and in acute hydrocephalus, apoplexy, and mania, accompanied by much mental excitement. Friction with ice and snow has been applied to *frost-bitten* parts. Internally ice is administered to relieve heartburn and vomiting, and to arrest gastric, nasal, bronchial, or uterine hæmorrhages.

Tepid, Warm, or Hot Water Baths.—The temperature of the *tepid bath* ranges from 29·4° C. to 33·3° C. (85° F. to 92° F.) ; that of the *warm bath* from 33·3° C. to 36·6° C. (92° F. to 98° F.) The warm bath is useful in the anasarca of scarlatina and of chronic kidney affections, and has been employed as a relaxant for the reduction of dislocations, and in herniæ. It has proved of great service in promoting the passage of urinary or biliary calculi. The temperature of the *hot bath* is from 36·6° C. to 44·4° C. (98° F. to 112° F.), and it is principally employed in paralysis, rheumatism, and some other chronic diseases. *Warm fomentations* are frequently used to allay inflammation and to relieve pain, tension, and spasm.

Internally tepid or warm water is taken into the stomach to excite vomiting ; to induce diaphoresis in rheumatism, gout, &c. It is injected into the *rectum* to produce evacuation ; into the *vagina* to relieve uterine pain and irritation, and to promote the flow of the lochia ; into the *bladder* to alleviate irritation of that viscus, and for distension of the organ previous to the operation of lithotrity.

The *vapour bath* is powerfully stimulant and sudorific. It is very valuable for the production of profuse sweating, and is used in chronic rheumatism, gout, anasarca from kidney disease, and in chronic diseases of the skin. It is also usefully employed in uterine affections, as chlorosis and amenorrhœa.

Warm aqueous vapour may be inhaled with great benefit in tonsillitis, in the scarlatinal sore throat, and in laryngitis.

Official Preparation.—Aqua Destillata. Distilled Water, H_2O. Ten gallons of water are distilled from a copper still, connected with a block-tin worm. The first half-gallon is

rejected, since it may contain carbonic acid, ammonia, and other impurities ; the next 8 gallons are preserved, and not distilled, in order to guard against empyreuma from the charring of organic matters.

AQUÆ MEDICATÆ. MEDICATED WATERS.

These waters are saturated aqueous solutions of essential oils, obtained by submitting fresh or dried vegetables, or their essential oils, to distillation with water, or in one instance (camphor water) by solution.

INFUSA (*Infusions*) are aqueous solutions of certain constituents of vegetable substances obtained without the aid of ebullition. They are prepared by digesting with distilled water (hot or cold) the substance, bruised, sliced, or in coarse powder, in a vessel fitted with a cover. Cold water is employed when the active principle is very volatile or when it is desirable to avoid the solution of any substance soluble in hot water. For instance, when it is wished to extract the bitter principle from quassia or calumba without taking up the starchy matter, cold water is preferred. Infusions are preferred to decoctions when the active principle is either volatilised by a boiling heat, as in the case of buchu and orange peel, or when it readily undergoes some chemical change by ebullition, as is the case with senna.

DECOCTA (*Decoctions*) are aqueous solutions of certain constituents of organic substances obtained by the aid of ebullition. In this process the volatile constituents of vegetables may be dissipated, and thus, when these are the active principles, the operation is open to objection.

LIQUORES (*Solutions*) generally consist of substances dissolved in or diluted with water.

MUCILAGINES (*Mucilages*) are gummy or amylaceous substances either dissolved or suspended in water.

MISTURÆ (*Mixtures*) are chiefly aqueous preparations, of which some contain earthy salts, or other ingredients, suspended by means of sugar or gum. They are usually administered in doses of not less than half an ounce.

SYRUPI (*Syrups*) are infusions or aqueous solutions of organic or inorganic bodies saturated with sugar.

Distilled water is also used in the making of extracts and other preparations.

NITROGEN. N=14.

A gas prepared by burning a piece of phosphorus in a confined portion of atmospheric air. Its properties are negative. Forms 79 per cent. of the air we breathe.

NITROUS OXIDE. LAUGHING GAS. N_2O.

This gas is colourless and is prepared by heating the nitrate of ammonium (NH_4NO_3), water (H_2O) and the gas being formed, thus : $NH_4NO_3 = 2H_2O + N_2O$.

Therapeutics.—It is much employed as an anæsthetic, especially for minor operations, as teeth extraction.

Respiration of this gas is not usually followed by depression or other unpleasant symptom. It may sometimes excite violent muscular action, and great care must be taken that the gas is pure, especially that the ammonium nitrate should contain no chloride. Too much heat should be avoided in its preparation, in case the nitrous oxide is rendered irritating from fumes of ammonium nitrate and certain irrespirable products of decomposition. The gas is inhaled from a waterproof cloth bag, which is furnished with a wooden nozzle. It is safer than chloroform, but its action is not nearly so prolonged. Before being employed for respiration the gas should be passed through a solution of potash and then through ferrous sulphate, in order to free it from any carbonic acid, nitric acid, and noxious oxides of nitrogen that may be formed.

ACIDUM NITRICUM. NITRIC ACID. HNO_3.

Preparation.—Nitric acid is prepared by the action of sulphuric acid upon nitrate of potassium or nitrate of sodium.

Sulphate of potassium or sulphate of sodium is formed, and the volatile nitric acid distils over.

Character and Tests.—When pure it is a colourless liquid.

The commercial acid is however yellowish or reddish, since it contains some nitrogen tetroxide (N_2O_4). When exposed to air it emits an acrid corrosive vapour. Poured on copper filings, dense red vapours of nitrogen tetroxide N_2O_4 are instantly formed ; but if the acid be mixed with an equal volume of water, and then added to metallic copper, it evolves a colourless gas (N_2O_2), nitrogen dioxide, which acquires an orange red colour (N_2O_4) as it mixes with the air, and which, if it be introduced into a solution of ferrous sulphate, communicates to this a dark purple or brown colour, due to the formation of ferric sulphate. Very minute quantities of nitrates may be recognised as follows ; the nitrate with copper-filings and sulphuric acid are placed in the test-tube (fig. 1 *a*), to which, by means of a cork, is adapted a small curved glass tube, containing at the bend (*b*) a drop or two of solution of proto-sulphate of iron ; heat is applied to the mixture in the test-tube, and in a few minutes the iron solution becomes brown or blackish.

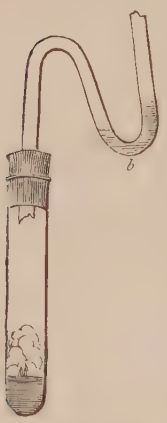


Fig. 1.—Apparatus for the detection of a nitrate.

If much chloride is mixed with the nitrate this test fails ; it is then advisable to add gold leaf and strong hydrochloric acid to the suspected nitrate, and boil the mixture. The fact of the gold becoming dissolved shows the presence of a nitrate, and the smallest amount of gold dissolved may be discovered upon adding to the liquid a few drops of protochloride of tin which develops the purple of cassius. When evaporated nitric acid should leave no residue, showing the absence of fixed impurities. It should contain no traces of sulphuric or hydrochloric acids.

90 grains by weight of nitric acid mixed with $\frac{1}{2}$ ounce of distilled water require for neutralisation 1,000 grain measures of the volumetric solution of soda, showing the presence of 70 per cent. by weight of nitric acid (HNO_3) corresponding to 60 per cent. of nitric anhydride (N_2O_5). Nitric acid being monobasic, 1,000 grain measures of the solution of soda, i.e. one

molecule of NaHO, will exactly neutralise one molecule of nitric acid (=63).

Therefore if 90 grains of nitric acid require 1000 measures of the solution of soda, 70 per cent. of nitric acid is present; for

$$90 : 100 :: 63 : x ; \therefore \frac{100 \times 63}{90 \times x} = \frac{6300}{90x} = 70 ; \therefore x = 70.$$

Nitric acid is used medicinally as follows:

Acidum Nitricum (*Aqua Fortis*).—This contains 70 per cent. by weight of nitric acid (HNO_3) corresponding to 60 per cent. of nitric anhydride (N_2O_5).

Acidum Nitricum Dilutum.—This is colourless and prepared as follows: nitric acid 6 fluid ounces; distilled water sufficient to make the mixture when cooled to 60° F. (15·5° C.) measures 31 fluid ounces; or 2,400 grains by weight of acid and distilled water sufficient to measure 20 ounces when cooled to 60° F. (15·5° C.) Five minims contain about 1 minim of the strong acid.

Acidum Nitro-Hydrochloricum Dilutum.—Diluted Nitro-Hydrochloric Acid contains free chlorine, hydrochloric, nitric, and nitrous acids, and other compounds dissolved in water. It is prepared from nitric acid 3 fluid ounces, hydrochloric acid 4 fluid ounces, distilled water 25 fluid ounces. The acids are added to the water and the mixture is kept in a glass-stoppered bottle for 14 days before it is used. It is a colourless liquid.

The mixture of nitric and hydrochloric acids yields chloronitrous gas ($N_2O_2Cl_2$) and chloronitric gas ($N_2O_2Cl_4$) and free chlorine (Cl), together with water, thus:

$$2HNO_3 + 6HCl = N_2O_2Cl_4 + 4H_2O + Cl_2 \text{ or}$$
$$2HNO_3 + 6HCl = N_2O_2Cl_2 + 4H_2O + 4Cl.$$

Therapeutics.—Externally strong nitric acid is applied to sores, warts, and hæmorrhoids. Diluted it has been applied to ulcers and in cancrum oris. When injected in a diluted state into the bladder it has proved efficacious in dissolving *phosphatic calculi.*

Internally the diluted nitric acid is refrigerant and tonic.

It is given in some forms of dyspepsia, in liver affections, and in some cutaneous affections.

Diluted nitro-hydrochloric acid is similar in its action to solution of chlorine. It is used in dyspepsia, as a solvent of phosphatic deposits in the urine, and for chronic affections of the liver. It is often used externally as a *foot-bath.*

Dose.—Of strong nitric acid, 1 minim to 3 minims freely diluted; of the diluted acid, 10 minims to 30 minims; of diluted nitro-hydrochloric acid, 5 minims to 20 minims well diluted. As a bath, 6 fluid ounces to the gallon of water (in a wooden vessel).

Adulterations.—These are chiefly sulphuric and hydrochloric acids, detected by chloride of barium and nitrate of silver respectively.

AMMONIUM. NH_4, AND ITS COMPOUNDS.

AMMONIÆ LIQUOR FORTIOR. STRONG SOLUTION OF AMMONIA.

Consists of ammoniacal gas (NH_3) dissolved in water, and constituting 32·5 per cent. of the solution. Colourless.

Preparation.—Chloride of ammonium and slaked lime are mixed and heated, and the resulting ammoniacal gas is passed into distilled water.

Ordinary **Liquor Ammoniæ** consists of 1 pint of strong solution of ammonia to 2 pints of distilled water. It is used in the preparation of *Linimentum ammoniæ*, *Tinctura quininæ ammoniata*, and the test solutions of ammonio-nitrate of silver, ammonio-sulphate of copper, and ammonio-sulphate of magnesium.

The preparations in which **liquor ammoniæ fortior** is used are: *Ammonii phosphas; Linimentum camphoræ compositum; Liquor ammoniæ; Liquor ammonii citratis; Spiritus ammoniæ aromaticus; Spiritus ammoniæ fœtidus;* and in *Tinctura opii ammoniata.*

Therapeutics.—Strong liquor ammoniæ is used as *a stimulant and sudorific* in fevers and the exanthemata, or *expectorant* in

certain pulmonary affections ; as *a nervine stimulant and antispasmodic*, in cases of poisoning by digitalis or hydrocyanic acid; as *a remedy for the bites of poisonous animals* ; as *an antacid in dyspepsia* and in poisoning by the mineral acids. It may also be employed as a vesicant, and occasionally as a caustic.

Dose.—That of the strong solution is from 3 to 10 minims, well diluted, but the ordinary liquor ammoniæ is usually employed, and is administered in doses from 5 to 30 minims, properly diluted.

AMMONII BENZOAS. BENZOATE OF AMMONIUM.

$NH_4C_7H_5O_2$.

Preparation.—Benzoic acid is dissolved in solution of ammonia, previously mixed with water ; the mixture is then evaporated at a gentle heat, the ammonia being kept in slight excess ; and it is then set aside that crystals may form.

Characters.—In colourless laminar crystals, soluble in water and in alcohol. Acidulated with diluted hydrochloric acid, it gives a deposit of benzoic acid ; when heated the salt sublimes, without residue. Its solution gives with persalts of iron a bulky yellowish precipitate of benzoate of iron.

Therapeutics.—Benzoate of ammonium is converted in the body into hippuric acid, and as such it appears in the urine ; it is given in chronic cystitis (inflammation of the bladder), and in an alkaline condition of the urine, or when a deposit of phosphates is present.

Dose.—10 to 20 grains.

AMMONII CITRAS. CITRATE OF AMMONIUM.

$(NH_4)_3C_6H_5O_7$.

Is contained in the **Liquor Ammonii Citratis Fortior**. The stronger solution of Citrate of Ammonium is prepared from citric acid, strong solution of ammonia, and distilled water.

The ordinary **Liquor Ammonii Citratis** is prepared from the strong solution 1 part, and distilled water 4 parts. It should be kept in bottles free from lead.

The *Dose* of the strong solution is ½ to 2 fluid drachms, that of the ordinary solution 2 to 6 fluid drachms.

Therapeutics.—Refrigerant, febrifuge, and slightly diuretic.

AMMONII NITRAS. NITRATE OF AMMONIUM.

NH_4NO_3.

Is produced by neutralising diluted nitric acid with solution of ammonia or carbonate of ammonium, evaporating the solution until crystals are obtained, and keeping these fused at a temperature not exceeding 320° F. (160° C.), until the vapour of water is no longer emitted. It is a colourless salt.

It is only used for the production of nitrous oxide.

AMMONII PHOSPHAS. PHOSPHATE OF AMMONIUM.

$(NH_4)_2PO_4$.

Preparation.—By mixing strong solution of ammonia with diluted phosphoric acid and collecting the resulting crystalline product.

Characters.—In transparent colourless prisms, soluble in water, insoluble in rectified spirit. When dissolved in water, and the solution of ammonio-sulphate of magnesium is added, a crystalline precipitate, consisting of ammonio-magnesian phosphate, falls. This salt evolves ammonia when heated with caustic potash. The aqueous solution gives with nitrate of silver a canary-yellow precipitate of silver orthophosphate.

Dose.—5 to 20 grains freely diluted.

Therapeutics.—Phosphate of ammonium, in solution, is said to dissolve urate of sodium, and to obviate the tendency to the formation of the uric acid calculus.

AMMONII BROMIDUM. BROMIDE OF AMMONIUM.

NH_4Br.

Preparation.—By decomposing solution of bromide of iron with solution of ammonia: ferric oxide, water and bromide of iron being formed; or by saturating hydrobromic acid with ammonia: water and bromide of ammonium being formed.

Characters and Tests.—In colourless crystals, which may become slightly yellow by exposure to the air, and have a pungent saline taste. May be sublimed unchanged by the application of heat. Readily soluble in water, less soluble in spirit.

A solution of the salt in water, mixed with mucilage of starch and a drop of an aqueous solution of bromine or chlorine, does not exhibit any blue colour, showing the absence of iodine.

Therapeutics.—Bromide of ammonium acts as a nerve sedative, and is used in whooping-cough and in epilepsy. It has been given in the same cases for which the bromide of potassium has been employed; its effects are not so lowering as those of the latter drug.

Dose.—2 to 20 grains.

AMMONII CHLORIDUM. CHLORIDE OF AMMONIUM.

NH_4Cl.

Preparation.—By neutralising ammonia or carbonate of ammonium with hydrochloric acid, and evaporating to dryness. It is usually prepared by sublimation.

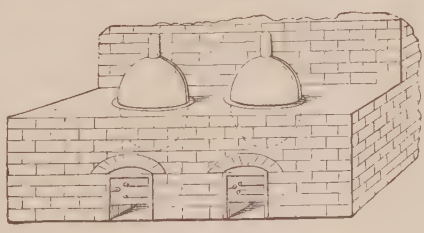


Fig. 2.—Sublimation of chloride of ammonium.

The ammoniacal liquor of the gas-works contains several salts of ammonium. In order to convert it into sal ammoniac, as the chloride is called, sulphuric acid is sometimes added and the liquor evaporated, by which means brown crystals of sulphate of ammonium are obtained. This salt is then mixed with sodium chloride and submitted to distillation in iron pots lined with clay, to which are adapted leaden domes or heads, in each of which is an aperture or open cylindrical tube capable of being closed or opened as occasion requires (fig. 2).

Characters and Tests.—In colourless inodorous minute crystals, or in translucent fibrous masses, tough, and difficult to powder; soluble in water and in rectified spirit. When heated, this salt volatilises without decomposition, and leaves no residue.

Fig. 3. Regular octahedron.

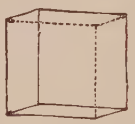


Fig. 4.—Cube.

The chloride of ammonium usually occurs in commerce as large hemispherical cakes, which by solution or resublimation may be obtained in regular octahedral (fig. 3), cubic (fig. 4), or plumose crystals formed of rows of minute octahedrons attached by their extremities.

Therapeutics.—Chloride of ammonium is occasionally used in this country, and in Germany is regarded as a powerful alterative, stimulant to the absorbents and resolvent of indurations. It is said to be a sedative in neuralgia, and is useful in chronic bronchitis with profuse expectoration. A mixture of 5 parts of this salt with an equal quantity of nitrate of potassium and 16 parts of water forms a *freezing mixture*, which has been used as an ice poultice for hernial tumours.

Dose.—5 to 20 grains.

It is used in preparing *Liquor ammoniæ fortior*, *Liquor hydrargyri perchloridi*, and the *Solution of ammonio-sulphate of magnesium*.

Adulterations.—Lead and iron may be present in the salt, derived from the apparatus used in its manufacture; or chloride of calcium may be present, which may cause the salt to deliquesce. The presence of iron communicates a red colour to the salt.

AMMONII SULPHYDRATUM. SULPHYDRATE OF AMMONIUM. NH_4HS.

It is prepared by passing sulphuretted hydrogen (H_2S) into solution of ammonia as long as the gas continues to be absorbed, then adding more ammonia, and finally transferring the solution to a well-stoppered green glass bottle.

The solution is colourless, becoming yellowish-green on exposure to light and air, in consequence of the formation of the disulphide and hyposulphite of ammonium by absorption of oxygen. Its odour is intensely pungent and disagreeable. It cannot be kept in white glass bottles, as it attacks the lead they contain. With neutral or alkaline solutions of calcium the aqueous solution gives a copious white precipitate of sulphide of calcium.

It is only used in solution as a test for metals.

AMMONII CARBONAS. CARBONATE OF AMMONIUM.

$N_3H_{11}C_2O_5$.

Preparation.—By submitting chloride of ammonium or sulphate of ammonium and carbonate of calcium to sublimation and resublimation; water, ammonia gas, chloride of calcium, and carbonate of ammonium being formed.

Characters.—In translucent crystalline masses with a strong ammoniacal odour and alkaline reaction; soluble in cold water, more sparingly in spirit.

This salt is probably a compound of the acid carbonate (NH_4HCO_3) with carbamate of ammonium ($NH_4NH_2CO_2$), and the compound molecule is generally considered to contain one molecule of each of these salts. When exposed to air the odour is dissipated, since the neutral carbonate is continually volatilised, a white opaque powder being left, consisting of the acid carbonate.

By the action of water the carbamate is converted into the neutral carbonate. Thus: $NH_4NH_2CO_2 + H_2O = (NH_4)_2CO_3$.

In the aqueous solution, therefore, both the acid carbonate and neutral carbonate will be present.

The neutral carbonate has never been isolated in the solid state.

The *Impurities* may consist of chlorides or sulphates.

Therapeutics.—Carbonate of ammonium is used in doses of from 5 to 10 grains, as a diaphoretic, and as a stimulant in low states of the system. It is antacid in dyspepsia, when accompanied by increased secretion of acid.

In doses of 30 grains it acts as an emetic, but is seldom so used. It is given in asthenic forms of bronchitis when the expectoration is deficient, and is often employed for preparing *effervescing draughts*, of which the following is a formula :

20 grains of carbonate of ammonium require { 6 fluid drachms of lemon juice, or $26\frac{3}{4}$ grains of citric acid, or $28\frac{3}{4}$ grains of tartaric acid.

The preparations in which ammonii carbonas is used are *Liquor ammonii acetatis fortior*, *Spiritus ammoniæ aromaticus*, and *Bismuthi carbonas*.

Adulterations.—The volatile carbonate of ammonium may be deficient in the salt from previous exposure, or chlorides or sulphates may be present.

Official Preparation.—Spiritus Ammoniæ Aromaticus, Aromatic Spirit of Ammonia, is prepared from carbonate of ammonium, strong solution of ammonia, volatile oil of nutmeg, oil of lemon, rectified spirit, and water.

Dose.—$\frac{1}{2}$ to 1 fluid drachm.

AMMONII ACETAS. ACETATE OF AMMONIUM.

$NH_4C_2H_3O_2$.

Is contained in **Liquor ammonii acetatis fortior**, the strong solution. It is a colourless solution.

Preparation.—By acting upon carbonate of ammonium with acetic acid ; water, carbonic acid, and acetate of ammonium being formed.

The ordinary **Liquor ammonii acetatis** is prepared from strong solution of acetate of ammonium, 1 part, and distilled water, 5 parts.

The solution should be kept in bottles, free from lead.

Therapeutics.—Acetate of ammonium increases the secretions, especially of the skin, and is much used as a diaphoretic and refrigerant in febrile conditions. In large doses it has been stated to relieve dysmenorrhœa.

The dose of liquor ammonii acetatis fortior is 25 to 75 minims ; that of the ordinary liquor is 2 fluid drachms to 6 fluid drachms freely diluted.

AMMONII OXALAS. OXALATE OF AMMONIUM. $(NH_4)_2C_2O_4,H_2O$.

Preparation. From purified oxalic acid, boiling distilled water, and carbonate of ammonium.

Used as a test for calcium salts, with which it throws down white precipitates, in neutral or alkaline solutions.

Characters. A white deliquescent salt in compressed crystalline masses soluble in water.

TESTS FOR THE SALTS OF AMMONIUM.

Ammonium salts are known by their white appearance, their alkaline reaction, volatility on heating, and by giving off ammonia gas when heated with caustic potash, soda, or lime.

CHLORUM. CHLORINE. Cl=35·5.

This gas is prepared by the action of hydrochloric acid upon black oxide of manganese.

Official Preparations.—(1) Liquor Chlori. Solution of Chlorine (the gas dissolved in water). It is a greenish yellow liquid, smelling strongly of chlorine, and is obtained from hydrochloric acid, black oxide of manganese in fine powder, and distilled water. It should be freshly prepared and kept in a green glass bottle in a cool place.

Dose.—10 to 20 minims properly diluted.

(2) Vapor Chlori. Inhalation of Chlorine (prepared from chlorinated lime and cold water). It is employed when local action upon the mouth, fauces, and bronchial tubes is desired.

For inhalation, either the aqueous solution of chlorine or a small quantity of the calx chlorinata may be placed in the inhaling bottles (figs. 5 and 6); if the latter substance is not sufficiently strong, a few drops of hydrochloric acid should be added to it in order to develop free chlorine.

Therapeutics.—This substance is employed as a fumigating, disinfectant, and antiseptic agent; it is a valuable antidote in

poisoning by sulphuretted hydrogen, sulphide of ammonium, sewer gas, and prussic acid. Free in vapour, it is a powerful irritant and stimulant, and is occasionally used in a diluted form in chronic bronchitis and phthisis, and pulmonary abscess accompanied by fœtid expectoration. The solution, when much diluted, may be employed as a gargle in aphthæ, ptyalism, and cancrum oris, or in ulceration of the tonsils, in scarlatina and diphtheria. Liquor chlori may be applied to foul ulcers and cancers, and to some cutaneous diseases.

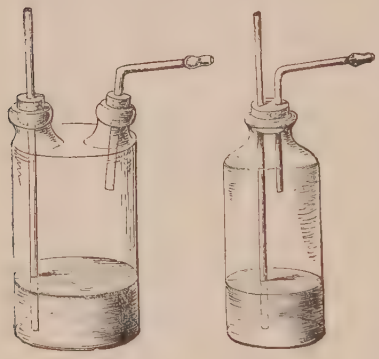


Fig. 5. Fig. 6.

Inhaling bottles.

ACIDUM HYDROCHLORICUM. HYDROCHLORIC ACID. HCl.

Hydrochloric acid gas dissolved in water, and forming about 32 per cent. by weight of the solution.

Preparation.—It may be obtained by the addition of diluted sulphuric acid to dried chloride of sodium and distilled water; disulphate of sodium and hydrochloric acid being formed.

The operation is conducted in a glass retort; the hydrochloric acid distils over, and is collected in a receiver filled with distilled water, by which the gas is absorbed rapidly.

By manufacturers an iron or stoneware pot is usually employed. This is set in brickwork over a fireplace, having a stoneware head luted to it, and connected with a row of double-necked bottles, of the same material and furnished with earthenware stop-cocks. The last bottle is provided with a safety tube which dips into a vessel of water (fig. 7).

The pure liquid hydrochloric acid may be prepared as shown in fig. 8.

Sulphuric acid and water are mixed and allowed to cool, and together with chloride of sodium are introduced into a flask or matrass. The gas is conveyed by a tube twice bent at

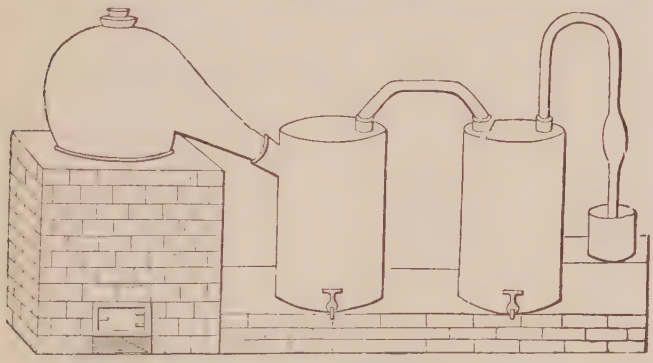


FIG. 7.—Apparatus for making hydrochloric acid.

right angles, and having a bulb blown on the descending limb. The tube is made to dip about an eighth of an inch into distilled water, contained in a bottle surrounded with ice-cold

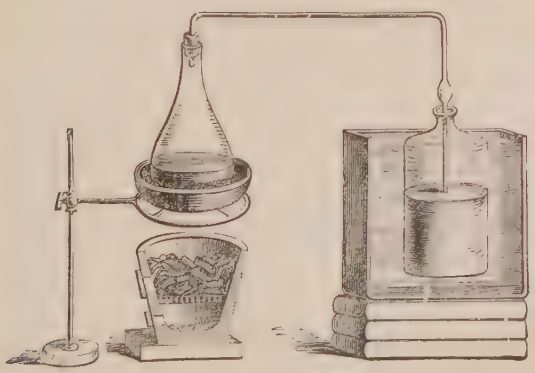


FIG. 8.—Hydrochloric acid apparatus.

water. Gentle heat is applied to the flask which rests in a sand-pot, and is continued so long as any hydrochloric acid comes over. Thus the distilled water becomes converted into pure

and colourless hydrochloric acid. If absorption takes place too rapidly, and the water rises in the tube, the bulb will receive it and the end of the tube becomes exposed, regurgitation of water into the flask being prevented by the entering air. This simple tube thus forms a self-acting valve.

Characters and Tests.—A nearly colourless and strongly acid liquid; the commercial acid may, however, be yellowish, from the presence of organic matter or of perchloride of iron derived from the iron stills used in its preparation. It emits white vapours on exposure to air, and has a pungent odour.

Hydrochloric acid gives with silver nitrate a curdy white precipitate of silver chloride, which is soluble in ammonia, and reprecipitated by nitric acid; when heated, silver chloride melts to a horny mass, and on exposure to light turns violet. The *Impurities* may be nitric, sulphuric, and sulphurous acids, free chlorine, iron, lead, antimony, and arsenic.

114·8 grains by weight of HCl, when mixed with half an ounce of distilled water, require for neutralisation 1000 grain measures of the volumetric solution of soda, indicating the percentage of the gas which the acid should include.

A molecule of HCl = 36·5 ∴ 114·8 : 100 :: 36·5 : x

$$\text{or } \frac{100 \times 36{\cdot}5}{114{\cdot}8 \times x} = 31{\cdot}8 \text{ per cent.}$$

It is used in preparing the acidum nitro-hydrochloricum dilutum, the numerous chlorides, and the following preparation.

Acidum Hydrochloricum Dilutum. Diluted Hydrochloric Acid is prepared by taking 8 fluid ounces of the strong acid, adding 16 ounces of water, and then adding more water, so that at a temperature of 60° Fahr. (15·5° C.) it shall measure 20½ fluid ounces, or 3000 grains by weight of acid and distilled water, sufficient to measure 20 ounces when cooled to 60° Fahr. 3¾ minims contain about 1 minim of the strong acid.

It is a colourless fluid with a peculiar odour.

Dose.—10 to 30 minims.

The preparations in which diluted hydrochloric acid are used are *Liquor morphinæ hydrochloratis* and *Liquor strychninæ hydrochloratis*.

Therapeutics.—Strong hydrochloric acid is powerfully caustic, producing on the skin and mucous membranes a white stain, which afterwards ulcerates. The diluted acid is refrigerant, antiseptic, tonic, and astringent, and is used as a gargle in diphtheria and ulceration of the throat.

BROMUM. BROMINE. Br.=80.

Preparation.—This is a liquid non-metallic element obtained from bromide of magnesium (existing in sea-water and some saline springs) by heating the bromide with sulphuric acid and black oxide of manganese; sulphate of magnesium, sulphate of manganese, water, and bromine are formed.

Characters and Tests.—A dark, brownish-red, very volatile liquid, with a strong disagreeable odour. It is slightly soluble in water, more so in alcohol, and very soluble in ether. At the common temperature of the air it gives off red vapours; with water it bleaches, but less powerfully than chlorine. Agitated with solution of soda in such proportions that the fluid remains very slightly alkaline, it forms a colourless liquid, due to the formation of bromide of sodium and bromate of sodium, which compounds are colourless.

If the colourless solution is coloured by the further addition of a small quantity of the bromine, it does not become blue on the subsequent addition of a cold solution of starch, showing the absence of iodine.

Therapeutics.—Bromine is seldom employed free, but has been applied on lint, when dissolved in rectified spirit, to cancer of the womb. Its chief preparations are the hydrobromic acid, and the bromides of ammonium, potassium, and sodium. It has been held in some estimation for reducing hypertrophy of the liver and spleen. Bromide of potassium may be given in certain cases of syphilis, in which the iodide is not well borne. Although it possesses the alterative powers of the iodide, it is far less powerful than that salt. It is

exhibited in diseases of the nervous system, in sleeplessness, and epilepsy, and is valuable in the treatment of priapism, nymphomania, and menorrhagia.

It has been said to check the formation of sugar in diabetes mellitus.

Acidum Hydrobromicum Dilutum.—Diluted Hydrobromic Acid is an aqueous solution containing 10 per cent. by weight of gaseous or real hydrobromic acid, HBr.

Preparation.—By pouring water over bromine in a glass cylinder, and then passing sulphuretted hydrogen through the solution ; lastly filtering and distilling.

Characters and Tests.—A colourless inodorous liquid with a sour taste and acid reaction. Chlorine water added to it liberates bromine, and colours the fluid yellow. It yields with silver nitrate a white curdy precipitate of bromide of silver only sparingly soluble in solution of ammonia, and insoluble in nitric acid. It should be free from sulphuretted compounds and from sulphuric acid, and does not become discoloured by keeping.

Dose.—15 to 50 minims diluted with water or syrup and water.

Therapeutics.—This acid acts in a similar manner to the bromides, but does not produce depression as is the case with bromide of potassium. It is given in exhaustion, nervous excitement, anæmia, headache, and as a solvent for quinine, and to prevent headache after taking quinine and iron. It has also been stated to relieve the ill effects of excess of alcohol drinking. 60 minims are equivalent to $8\frac{2}{3}$ grains of bromide of potassium in the quantity of bromine.

IODUM. IODINE. I=127.

A non-metallic element, obtained principally from the ashes of sea-weeds, and from mineral iodides and iodates. A dark mass, termed *kelp*, is formed when sea-weeds are burnt ; by solution of this substance in water the soluble salts, iodides, &c., are obtained. The solution is concentrated, and sulphuric

acid is added to form hydriodic acid, and it is finally distilled with dioxide of manganese ; water, sulphate of manganese, and iodine being formed, of which the last volatilises and is condensed in receivers.

The mother liquor (the *iodine ley*) formed during the process is introduced into a leaden still (fig. 9 *a*), and heated to 140° F., the black oxide of manganese being then added.

A leaden head with two stoppers (*b* and *c*) is then adapted and luted with pipe-clay, and to the neck of the head is fitted a series of spherical glass condensers (*d*), each having two mouths opposite to each other, and inserted the one into the other. The evolved iodine is collected in the condensers. The process is watched by the occasional removal of the stopper (*c*), and additions of sulphuric acid or manganese oxide made by *b*, if requisite.

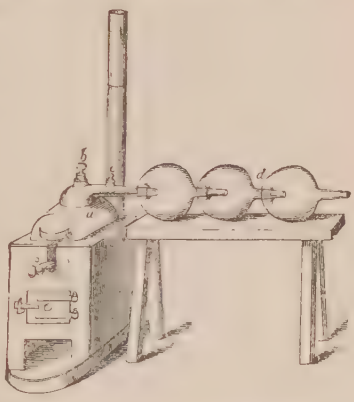


FIG. 9. -Iodine leaden still and glass receiver.

Characters and Tests.—In laminar crystals of a peculiar odour, dark colour, and metallic lustre, which, when heated, yield a beautiful violet-coloured vapour. It is very sparingly soluble in water, but freely dissolved by alcohol, chloroform, and ether, and by a solution of iodide of potassium.

The aqueous solution strikes a deep blue colour with starch (iodide of amiden). Iodine sublimes without leaving any residue, and the portion that first comes over does not include any slender colourless prisms emitting a pungent odour, showing freedom from iodide of cyanogen. 12·7 grains dissolved in an ounce of water containing 15 grains of iodide of potassium require for complete discoloration 1,000 grain measures of the volumetric solution of hyposulphite of sodium in order to convert the entire 12·7 grains of iodine into colourless iodide and sodium tetrathionate.

Official Preparations.—Linimentum Iodi.—Liniment of Iodine: made by dissolving iodine, iodide of potassium, and glycerine in rectified spirit. (About 1 of iodine in 9.)

Liquor Iodi.—Solution of Iodine (iodine and iodide of potassium, dissolved in distilled water). (1 of iodine in 20.)

Tinctura Iodi.—Tincture of Iodine (iodine, iodide of potassium, dissolved in rectified spirit). (1 of iodine in 40.)

Unguentum Iodi.—Ointment of Iodine (iodine and iodide of potassium, and glycerine rubbed together; prepared lard being then added and the whole well mixed). (1 of iodine in 31.)

Vapor Iodi.—Inhalation of Iodine. Tincture of iodine, 1 drachm, and water 1 ounce are mixed; gentle heat is applied and the rising vapour inhaled.

The *Dose* of free iodine is $\frac{1}{2}$ grain, gradually increased, and of tinctura iodi, 5 to 20 minims.

Therapeutics.—When applied *externally*, free iodine may act either as an irritant or vesicant; rubbed upon the skin for some time, it may become absorbed, and the system at large become affected. When the diluted vapour is inhaled, the mucous membrane of the respiratory passages is acted upon topically. *Internally* administered, irritation of the intestinal mucous membrane is set up. Iodine is absorbed very rapidly into the blood, and its presence may be detected in the urine and other secretions. It increases the activity of the kidneys, mucous membranes, and skin by its action, and powerfully influences the glandular and absorbent systems. It is also a powerful alterative, inducing catarrhal symptoms in large doses.

Iodine and its salts are indicated in bronchocele, scrofula, and glandular enlargements; in hypertrophy of the liver, spleen, and uterus; in chronic skin affections, whether syphilitic or otherwise; in gout, chronic rheumatism, tertiary syphilis, and leucorrhœa; it may also be given as a diuretic in dropsies.

Adulterations. Water, iodide of cyanogen, blacklead, black oxide of manganese, charcoal or iron may be present.

SULPHUR. S=32.

NATIVE SULPHUR.—May be extracted by distillation in earthen pots in a furnace gallery. The pots are arranged in two rows in a large oblong furnace (fig. 10, 1, 1), the top of each pot, which serves for the introduction of the sulphur and for the removal of the residuum, being kept closed during the operation. The upper and lateral part of each pot communicates with an inclined tube of about two inches diameter, and fourteen long. When the fire is lighted in the furnace, the sulphur fuses and sublimes, and passes through this tube into another pot (2), placed on the outside of the furnace, and perforated near its bottom to allow the melted sulphur to flow into a pail (3) containing water, in which it congeals and forms the *rough* or *crude sulphur*.

FIG. 10.—Distillation of native sulphur.

Sulphur is refined by distillation and sublimation. By distillation the *massive* sulphur is obtained; by sublimation, *flowers* of sulphur.

The crude sulphur is placed in an iron pot (fig. 11) set in brickwork, over a proper fire. To this is adapted an iron head (*a*), removable by a crane, and which communicates by two tubes (*b* and *f*), the one with the sulphur chamber (*d*), the other with the iron receiver (*g*), which is immersed in water. When the communication (*f*) between the still and receiver is shut off, the sulphur distils into the sulphur chamber (*d*), and is deposited on its walls in a pulverulent form. In this state it is known as *flowers of sulphur*. The door leading to this chamber is situated near the ground, and is closed while the process is going on. Should the communication (*b*) between the still and the sulphur chamber be shut by turning the handle (*c*), and the communication (*f*) between the still and the receiver (*g*) be opened, the sulphur distils over and condenses into a liquid, which, when solidified, constitutes the *refined*

sulphur of commerce. The elbow pipe by which the communication between the still and receiver is formed, is encased

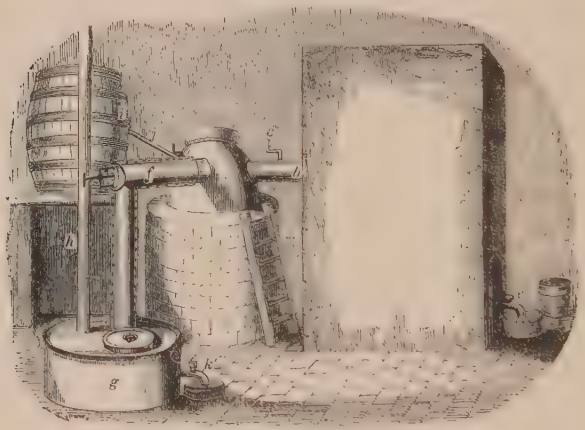


FIG. 11.—Distillation of sulphur.

a, Cast iron still; *b*, communication between the still and the sulphur chamber (*d*); *c*, handle by which this communication is shut off; *e*, vent pipe, one end of which opens into the chamber, the other dipping under water; *f*, communication between the still and receiver; *g*, iron receiver; *h*, vent pipe; *i*, water butt which supplies cold water by the pipe *j* to cool the distilled sulphur, and afterwards runs off at *k*.

in a metal jacket, between which and the tube a current of cold water is continually flowing from the butt (*i*), and after passing around the receiver (*g*) escapes at *k*. The top of the receiver is perforated by a vent pipe (*h*), and is supplied with a circular aperture, by which the liquid sulphur can be ladled out, but which is generally kept closed by means of a movable lid.

FIG. 12.—Acute rhombic octahedron (the principal form of native sulphur).

FIG. 13.—Oblique rhombic prism (principal form of sulphur by fusion and slow cooling).

The acute rhombic octahedron of native sulphur, and the oblique rhombic prism of sulphur obtained by fusion and slow cooling, are shown in figs. 12 and 13 respectively.

SULPHUR PRÆCIPITATUM. PRECIPITATED SULPHUR.

Preparation.—Sublimed sulphur and slaked lime are well mixed in water, and boiled and filtered, diluted hydrochloric acid being then added to the filtrate, until effervescence ceases, and the mixture acquires an acid reaction. The precipitate is allowed to settle, the supernatant liquid decanted off, fresh distilled water is poured on, and purification continued by affusion of distilled water and subsidence, until the fluid ceases to have an acid reaction and to precipitate with oxalate of ammonium, showing absence of all the resulting (soluble) chloride of calcium. The precipitated sulphur is then collected and dried.

Slaked lime and sublimed sulphur yield pentasulphide of calcium, hyposulphite of calcium, and water ; and hydrochloric acid acting upon these calcium salts, produces chloride of calcium, water, and precipitated sulphur.

Characters and Tests.—A greyish-yellow soft powder, free from grittiness and from the smell of sulphuretted hydrogen. When heated in an open vessel, it burns with a blue flame and the evolution of sulphurous acid. Entirely volatilised by heat.

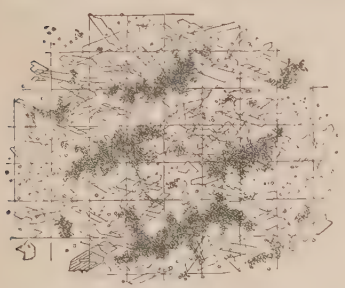


FIG. 14.—Microscopic appearance of pure precipitated sulphur. The micrometer squares are equal to those seen in figs. 15 and 16.

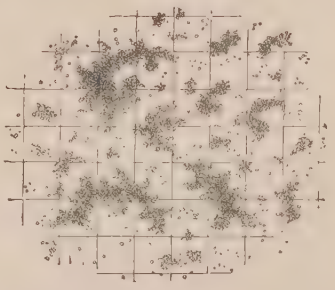


FIG. 15.—Microscopic appearance of commercial (*i.e.* impure) precipitated sulphur, showing the crystals of sulphate of calcium (selenite).

Under the microscope it is seen to consist of opaque globules (fig. 14) without any admixture of crystalline matter, showing the absence of sulphate of calcium (fig. 15), which would be

present had sulphuric acid been employed instead of hydrochloric acid in its preparation. Otherwise it corresponds with sublimed sulphur.

Dose.—20 to 60 grains.

Official Preparation.—Trochisci Sulphuris.—Sulphur Lozenges: Tincture of orange-peel is mixed with precipitated sulphur, acid tartrate of potassium, refined sugar, and gum acacia (all in powder), mucilage of acacia being added to form a suitable mass, which is divided into lozenges, and dried in a hot-air chamber at a moderate temperature.

Each lozenge contains five grains of sulphur.

Dose.—1 to 6 lozenges.

Therapeutics.—These lozenges have been found very useful as an hepatic stimulant in cases of chronic constipation.

SULPHUR SUBLIMATUM. SUBLIMED SULPHUR.

Preparation.—From the crude or rough sulphur by sublimation. It can be also procured from metallic sulphides; but in this case it is liable to contain impurities, such as the sulphide of arsenic.

Characters and Tests.—A slightly gritty powder of a fine greenish-yellow colour, without taste and without odour, unless heated; burning in open vessels with a blue flame and the evolution of sulphurous acid gas; entirely volatilised by heat, showing the absence of fixed impurities. Soluble in oils and turpentine with heat. Solution of ammonia, agitated with it and filtered, leaves no residue on evaporation, indicating freedom from sulphide of arsenic. It does not redden moistened litmus paper, showing absence of sulphurous and sulphuric acids.

Fig. 16.—Microscopic appearance of sublimed sulphur. The micrometer squares are equal to those seen in figs. 14 and 15.

Examined by the microscope, the powder is found to con-

sist of smooth, almost opaque, nodular masses, composed of globules united together while in the liquid state (fig. 16).

Dose.—20 to 60 grains.

Official Preparations.

Confectio Sulphuris.—Confection of Sulphur (sublimed sulphur, acid tartrate of potassium in powder, syrup of orange-peel, and powdered tragacanth, rubbed well together).

Dose.—1 to 2 drachms.

Unguentum Sulphuris.—Ointment of Sulphur (sublimed sulphur and benzoated lard mixed thoroughly).

Sublimed sulphur is contained in the *Emplastrum Ammoniaci cum Hydrargyro*, the *Emplastrum Hydrargyri*, and *Pulvis Glycyrrhizæ Compositus*; it is also used in preparing the *Antimonium Sulphuratum*, the *Potassa Sulphurata*, and the following iodide:

SULPHURIS IODIDUM. IODIDE OF SULPHUR. S_2I_2.

Preparation.—By mixing iodine and sublimed sulphur together in a glass or earthenware mortar, then heating the mixture in a flask until the colour has become uniformly dark throughout, the heat being then increased so as to produce liquefaction. Lastly, the heat is withdrawn, and when the liquid has congealed, the mass is removed by breaking the flask, reduced to pieces, and kept in a well-stopped bottle.

Characters and Tests.—A greyish-black solid substance, with a radiated crystalline appearance. It resembles iodine in smell, and in the property of staining the cuticle when applied to it. Soluble in about 60 parts of glycerine; insoluble in cold water If 100 grains be boiled thoroughly with water, the iodine will pass off in vapour, and about 20 grains of sulphur remain.

Official Preparation.—Unguentum Sulphuris Iodidi.—Ointment of Iodide of Sulphur is made by adding, gradually, a melted mixture of hard and soft paraffins to iodide of sulphur, previously well triturated, and rubbing them together until the ointment is cold and free from grittiness.

Therapeutics.—Sulphur when administered in small doses acts as a stimulant to the skin and the mucous membranes, part passing from the skin as sulphuretted hydrogen, and part from the kidneys as sulphuric acid. In larger doses it acts as a laxative or mild purgative. When externally applied, it destroys the itch insect, and it may be employed in chronic diseases of the skin, as scabies, impetigo, and prurigo. It is administered in chronic bronchitis as a stimulating expectorant, and is serviceable in piles as a mild laxative. It is also used in chronic rheumatism. The ointment of iodide of sulphur has much repute in the treatment of skin eruptions.

ACIDUM SULPHURICUM. SULPHURIC ACID. H_2SO_4.

This acid (produced by the combustion of sulphur and the oxidation and hydration of the resulting sulphurous acid gas, by means of nitrous and aqueous vapours) contains about 98 per cent. by weight of real sulphuric acid (H_2SO_4).

At fig. 17 is seen the plan of a sulphuric acid manufactory. Sulphur and nitrate of potassium are employed, sulphurous anhydride (SO_2) being given off by the former, and nitrous anhydride (N_2O_3) from the latter. Sulphuric anhydride (SO_3) is formed, and, meeting with jets of steam, is converted into sulphuric acid (H_2SO_4). The nitrate pan is of cast iron. It is placed in the burner when required. The process consists of four stages, viz. : 1. The oxidation of the sulphur, and its conversion into sulphurous acid. 2. The oxidation of the sulphurous acid, and its conversion into sulphuric acid. 3. The concentration of the diluted sulphuric acid in leaden pans, and 4, the final concentration in platinum retorts.

Characters and Tests.—A colourless liquid of oily consistence, intensely acid and corrosive. Chars most vegetable substances, becoming itself blackened. Oxalic acid is decomposed by it without blackening. It evolves much heat on the addition of water, and when thus diluted, gives a copious white precipitate with chloride of barium, forming insoluble sulphate of barium. 50 grains by weight, mixed with an ounce of distilled water, require for neutralisation 1,000 grain measures of the volumetric solution of soda.

One molecule of solution of soda (NaHO) neutralises half a molecule of H_2SO_4, *i.e.* $\frac{98}{2} = 49$ grains, this acid being dibasic; but 50·6 grains of the official acid should contain exactly 49 grains of the pure acid, *i.e.* 96·8 per cent., corresponding to 1,000 grain measures of the volumetric solution of soda; thus :—

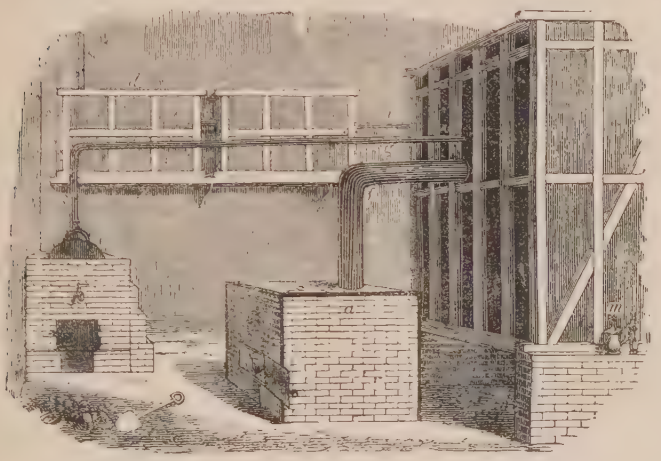


FIG. 17.—Oil of vitriol manufactory.

a, Sulphur-burner or furnace; *b*, first leaden chamber; *c*, *d*, second and third smaller leaden chambers containing water; *e*, steam boiler; *f*, flue-pipe or chimney of the furnace; *g*, steam pipe; *h*, flue or pipe conveying the residual gas from the first to the second leaden chamber; *i*, pipe conveying the gas not absorbed in the first and second chambers into the third; *k*, the flue or waste pipe; *l*, manhole by which the workmen enter the chamber when the process is not going on; *m*, pipe for withdrawing a small portion of sulphuric acid from the chamber in order to ascertain its specific gravity by the hydrometer.

$$50{\cdot}6 : 100 :: 49 : x = \frac{4900}{50{\cdot}6x} \therefore x = 96{\cdot}8.$$

Adulterations.—Water, known by the low specific gravity. Lead, detected by dilution with water, a white precipitate falling. Arsenic, from the use of impure sulphur during manufacture, detected by giving a yellow precipitate with sulphuretted hydrogen. Hydrochloric acid, due to impurities in the nitre used for generating the nitrous vapours. Nitric acid, detected

by the brown colour formed with sulphate of iron solution. Sulphuric acid sometimes becomes discoloured from traces of organic matter.

Official Preparations.—Acidum Sulphuricum Dilutum. Diluted Sulphuric Acid ; 7 fluid ounces of the strong acid are mixed gradually with distilled water, sufficient to measure 83½ fluid ounces when cooled to 60° Fahr. or 1,350 grains by weight of acid and distilled water, sufficient to measure 20 ounces when cooled to 60° Fahr.

12 minims contain 1 minim of strong sulphuric acid.

Dose.—5 to 30 minims. It is contained in *Infusum Rosæ Acidum* (1 fluid drachm to 10 fluid ounces).

Acidum Sulphuricum Aromaticum. -Aromatic Sulphuric Acid is prepared by mixing sulphuric acid gradually with rectified spirit, spirit of cinnamon and tincture of ginger being then added = (1 in 14).

Contained in *Infusum Cinchonæ Acidum* (1 fluid part in 80 fluid parts).

Dose. 5 to 30 minims : best given alone and taken in water.

It is useful in checking some forms of diarrhœa.

Therapeutics.—The strong sulphuric acid is caustic, and chars the skin. The diluted acid is tonic, refrigerant, and astringent, and is given to allay thirst in hectic fever, to relieve the night-sweats of phthisis, and to check diarrhœa.

The strong acid rubbed up with lard is sometimes applied to obstinate forms of skin disease.

ACIDUM SULPHUROSUM. SULPHUROUS ACID. H_2SO_3.

This consists of sulphurous anhydride (SO_2) dissolved in water, and constituting 5 per cent. by weight of the solution, equivalent to 6·4 per cent. of real sulphurous acid, H_2SO_3.

Preparation.—By the distillation of sulphuric acid with wood charcoal broken into small pieces. The carbon combines with part of the oxygen of the sulphuric acid, forming carbonic anhydride and leaving sulphurous acid.

Dose.—½ to 1 fluid drachm.

Characters and Tests.—A colourless liquid with a pungent sulphurous odour. It gives but a very slight precipitate with

chloride of barium, showing freedom from sulphuric acid ; but gives a copious precipitate if solution of chlorine is also added, the sulphurous acid being then converted into sulphuric acid.

Therapeutics.—When sulphurous acid is externally applied, redness and irritation are set up It is a powerful deoxidising agent, antiseptic and disinfecting. It is seldom given internally, but has been used for sarcina ventriculi in doses of ½ to 1 drachm in a wine glass of water. It is usually employed in the form of sulphite and hyposulphite of sodium. Has been used as a spray in sore throat, diphtheria and bronchitis, diluted with 1 or 2 parts of water. It destroys the germs of fungi in wounds, and has been employed in the treatment of skin affections, especially when associated with vegetation, such as tinea and pityriasis versicolor.

PHOSPHORUS. P=31.

This substance is a non-metallic element obtained from bones. It is prepared as follows :

Bone-ash or the phosphate of calcium is digested with diluted sulphuric acid. Sulphate of calcium is precipitated and superphosphate of calcium held in solution ; on evaporation, the superphosphate of calcium becomes the metaphosphate of calcium.

The metaphosphate of calcium is heated with charcoal ; carbonic oxide is given off, orthophosphate of calcium is formed, and the crude phosphorus thus obtained is collected in a receiver filled with cold water. It is now purified by melting it under water and shaking it with a mixture of sulphuric acid and bichromate of potassium to get rid of any trace of oxide, &c., and it is ultimately cast into sticks in glass moulds.

Characters and Tests.—A semi-transparent, colourless, wax like solid, emitting white vapours when exposed to the air. It is soft and flexible at common temperatures, melts at 110° Fahr. (43·3° C.), ignites in the air at a temperature a little above its

melting-point, burning with a luminous flame and producing dense white fumes. Insoluble in water, but soluble in ether, and in boiling oil of turpentine.

Dose.—$\frac{1}{40}$ to $\frac{1}{20}$ of a grain dissolved in olive oil or ether. When dissolved in ether the phosphorus is liable to form a coating on the tongue, due to the evaporation of the volatile ether.

Official Preparations.—Oleum Phosphoratum. — Phosphorated Oil is prepared thus: 16 grains of phosphorus are added to 4 ounces of almond oil previously heated to 300°F. (149°C.) for 15 minutes, and allowed to cool and filtered. This mixture is placed in a bottle capable of holding $4\frac{1}{2}$ ounces and heated in a water bath to 180°F. (82·2°C.), the stopper being removed two or three times to allow the expanded air to escape and then shaken frequently until dissolved (about 1 in 100). It is a clear, straw-coloured oil, phosphorescent in the dark.

Dose.—5 to 10 minims.

Pilula Phosphori.—Pill of Phosphorus is made by placing phosphorus (3 grains) and balsam of tolu (120 grains) in a mortar half filled with hot water; they are then rubbed together under the water until no particles of phosphorus are visible, a temperature at or near 140°F. (60° C.) being maintained. Yellow wax (57 grains) is now added, and the whole blended together.

When dispensed every 2 grains of the product is to be incorporated with 1 grain of curd soap, a few drops of rectified spirit being added, if necessary, to soften the whole.

Three grains of the mass including the soap will contain $\frac{1}{30}$th of a grain of phosphorus =(1 in 90).

Dose.—2 to 4 grains.

Therapeutics. Phosphorus is given to improve nerve tone, and to repair nerve tissue. It is said to act as a powerful general stimulant, chiefly on the kidneys and genital organs, inducing aphrodisia. Its too free use may, however, produce gradual decay of the genital functions, and lead to general paralysis. It is also used in nervous diseases and in phthisis. It is liable to produce considerable gastro-intestinal disturbance

when large doses are taken. Necrosis of the jaw-bone occurs in persons who have been exposed to the fumes of phosphorus for a lengthened period; this result is probably due to the presence of phosphorous acid, but it is not so common now as in former days, since the red amorphous phosphorus is at the present time more generally employed. The hypophosphites of calcium and sodium are other forms of administering phosphorus in loose combination.

Acidum Phosphoricum Concentratum.—Concentrated Phosphoric Acid consists of phosphoric acid, H_3PO_4, with 33·7 per cent. of water.

Preparation.—Phosphorus is boiled with nitric acid until the former has completely disappeared. The fluid is then concentrated and transferred to a platinum vessel, and still further evaporated until orange-coloured vapours (consisting of the higher oxides of nitrogen) are no longer evolved. This acid may also be prepared from phosphorus by treating the product of atmospheric oxidation with water and a little nitric acid.

Characters and Tests.—A colourless syrupy liquid with a sour taste and strongly acid reaction. Evaporated it leaves a residue which melts at a low red heat, and upon cooling presents a glassy appearance. Diluted with water it yields a canary yellow precipitate with ammonio-nitrate of silver, soluble in ammonia and in diluted nitric acid.

It should contain no trace of metals (specially arsenic), nitric, sulphuric, hydrochloric, phosphorous or metaphosphoric acids.

Dose.—2 to 5 minims well diluted.

It is contained in *Syrupus Ferri Phosphatis*, the official phosphates, and in the following preparation:

Acidum Phosphoricum Dilutum.—Diluted Phosphoric Acid consists of phosphoric acid, H_3PO_4, in solution in water to the extent of 13·8 per cent. by weight, corresponding to 10 per cent. of phosphoric anhydride, P_2O_5.

Preparation.—From concentrated phosphoric acid, 3 fluid ounces of which are mixed with distilled water sufficient to make up 20 fluid ounces.

Characters and Tests.—A colourless liquid. 6 fluid drachms contain one half of the molecular weight of phosphoric

acid in grains, 49 (H_3PO_4=98), equivalent to one-fourth of the molecular weight of phosphoric anhydride in grains, 35·5 (P_2O_5=142).

Dose.—10 to 30 minims and upwards, freely diluted.

Therapeutics.—A valuable nerve tonic, somewhat like diluted sulphuric acid, but less astringent and more palatable. It allays tickling cough and also the thirst in diabetes mellitus, is said to influence the growth of bony tumours, and may be advantageously exhibited in the treatment of affections connected with alkalinity of the urine.

It is employed in rickets combined with phosphate of calcium; and has also been found serviceable when given in frequent doses in cases of diarrhœa and vomiting resulting from a bilious attack.

BORON. B=11.

BORAX. BIBORATE OF SODIUM. $Na_2B_4O_7+10H_2O$.

Source.—This salt is found native in Thibet, being produced by spontaneous evaporation, and is imported as crude borax or tinkal from India; it is also prepared in Tuscany by neutralising with carbonate of sodium the boric acid obtained from the lagoons or *soffioni* of this district. It is also obtained from the native borate of calcium of Peru.

The lagoons of Tuscany extend over many miles. The earth, chiefly calcareous, of this part, continually evolves aqueous and sulphuric vapours, which upon bursting produce boric acid. Round the fissures a circular basin is dug. Into these basins or *lagoni* situated at different levels water is admitted, and confined in each basin for some hours, until saturated with acid. It is then drawn off to a basin on a lower level, and there allowed to remain an equal length of time, until it reaches a building at the bottom of the hill, in which the process of evaporation is conducted. It here enters a reservoir or cistern, and being cleared of impurities is drawn off into flat

leaden pans, and evaporated and concentrated until the boric acid crystallises (fig. 18).

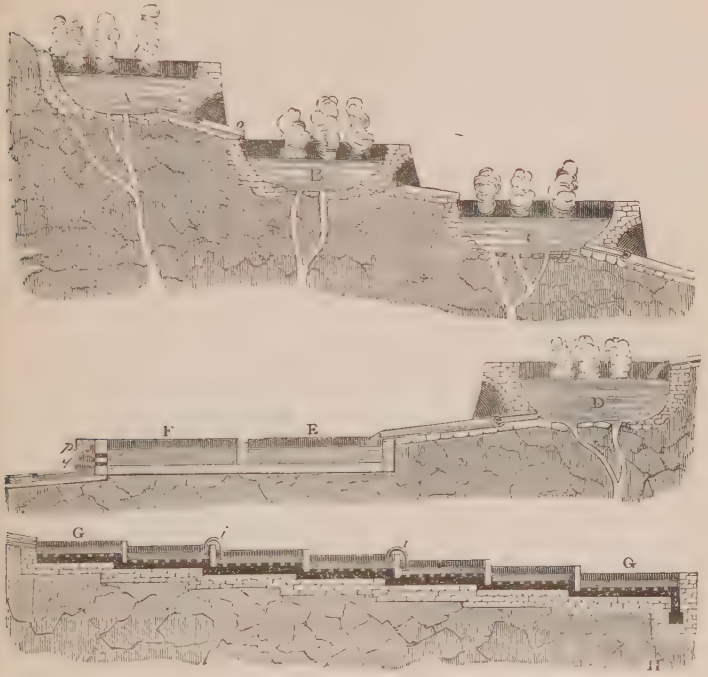


FIG. 18.—A, B, C, D, Lagoons (lagoni). The vapours enter at the bottom and escape through the water into the air. As soon as the water in the upper lagoon, A, is sufficiently charged with acid, it is allowed to run through the tube *a* into the lower lagoon, B. In this way it passes successively from B to C, from C to D, and from D into the reservoir E.

E, F, Reservoirs or cisterns. In these the solution is allowed to rest and deposit mechanical impurities. By the removal of the upper plug, *p*, the solution escapes into the upper evaporating pan, G.

G, G, Leaden evaporating pans. They are supported by rafters, and are heated by the aqueous vapours which enter at H and are confined in drains. The acid solution is conveyed from one pan to another by means of leaden syphons, *i*, *i*.

Characters and Tests.—In transparent colourless crystals, sometimes slightly effloresced, having a weak alkaline reaction; sparingly soluble in water, but rendered much more soluble by the presence of cream of tartar. A hot saturated solution, when acidulated with any of the mineral acids, lets fall, as it

cools, a scaly crystalline precipitate (boric acid), the solution of which in spirit burns with a green flame.

Dose.— 5 to 40 grains.

Official Preparations.—Mel Boracis.—Borax Honey is formed by mixing borax in fine powder with clarified honey and glycerine = (about 1 in 7).

Glycerinum Boracis.—Glycerine of Borax. Borax in powder, glycerine, and distilled water are rubbed together in a mortar until the borax is dissolved, or heated gently until dissolved.

Therapeutics.—Borax acts like a mild alkali: it is refrigerant and tends to produce diuresis. It is used in combination with

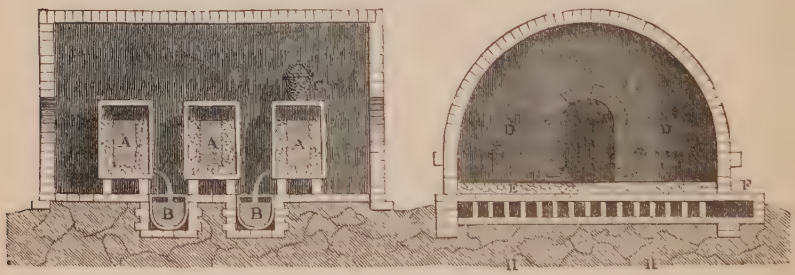


Fig. 10.—Boric acid crystallisation and drying chambers (old process).

A, A, A, Wooden tubs lined with lead in which the acid crystallises; B, B, mother liquor; C, basket in which the crystallised acid is placed to drain before it is conveyed to the drying chamber; D, D, drying chamber; E, F, boric acid drying on the floor, F between which and the lower floor, H, H, the hot vapour circulates.

ergot and cinnamon water to produce expulsion of the placenta, and is used as an emmenagogue. It exercises a peculiar soothing influence when applied to mucous membranes, and may be employed as a gargle with glycerine or honey in an aphthous state of the throat or tongue, and in mercurial salivation; it is also used as a lotion in irritable conditions of the vagina and uterus; a saturated solution is successfully applied to pityriasis versicolor; it dissolves the epidermis, and thus removes the parasite.

Acidum Boricum.—Boric or boracic acid, H_3BO_3, is a weak acid, produced by the action of sulphuric acid on borax, and also by the purification of native boric acid.

Characters and Tests.—Colourless, pearly, lamellar crystals, or irregular masses of crystals, unctuous to the touch, taste feebly sour and bitter, leaving a sweetish after flavour. Its solution turns blue litmus red, and turmeric paper brown; the latter is unchanged in the presence of hydrochloric acid. The alcoholic solution burns with a flame tinged with green. It should not contain any sulphates, chlorides, calcium salts, or sodium, or other metallic impurities.

Dose.—5 to 30 grains.

Official Preparation.—Unguentum Acidi Borici. Ointment of boric acid is prepared by melting hard paraffin (2), and soft paraffin (4) together, and adding boric acid (1), which is distributed over the surface of the liquid by passing it through a sieve; then stirring constantly together until cold.

Therapeutics.—Antiseptic, used for checking fœtid odours. Used as an eye and ear wash, also as a dressing for granulating and suppurating surfaces generally; very useful in surgical dressings, either as the ointment, or in 5 per cent. solutions, or as boric lint (lint soaked in a hot saturated solution and dried); with glycerine, borax, or honey, it is employed with great success as an application for aphthæ and stomatitis.

The ointment is a very valuable application in diseases of the skin and scalp.

CARBON. C=12.

CARBO LIGNI. WOOD CHARCOAL.

Consists of wood (oak, beech, hazel, willow, and poplar) charred by exposure to a red heat without access of air. It occurs in black, brittle, porous masses easily powdered, very light, without taste or smell, retaining the shape and texture of the wood from which it was obtained. When burned at a high temperature with free access of air, it leaves not more than 2 per cent. of ash.

Official Preparation.—Cataplasma Carbonis. Charcoal Poultice is prepared from wood charcoal in powder, crumb of bread, linseed meal, and boiling water.

Therapeutics.—Wood charcoal is used internally as an antiseptic and to correct acidity and flatus. Externally it is used as a poultice for fœtid ulcers, and also as a dentifrice. Internally, and recently prepared, it is given in doses from one teaspoonful to one tablespoonful. It has been made into biscuits, and is occasionally given in the form of lozenges.

CARBO ANIMALIS. ANIMAL CHARCOAL, or BONE BLACK.

This is the residue of bones after exposure to a red heat in the absence of air. It consists principally of carbon, and phosphate and carbonate of calcium.

The bones are boiled to remove fatty matter. The larger pieces are selected for the making of buttons, etc.; the smaller portions are sold as manure, and the rest are submitted to distillation. The bones are introduced at the upper end of the retort (*b*, fig. 20). Volatile products pass away by the iron pipe (*c*). After passing through the cistern (*d*), they are conveyed to a series of receivers (*f* and *g*) in which are deposited the brown ammoniacal liquor or *bone spirit*, and the empyreumatic or animal oil. The solid residue in the retort is removed while red hot, through the lower and underground end of the retort, into wrought iron canisters (*l*), which are immediately closed by iron covers, luted to render them air-tight, and then raised to the surface by a crane (*k*). When cold it is ground, and sold as *animal bone*, or *ivory black*.

Bone black is used in preparing :—

CARBO ANIMALIS PURIFICATUS. PURIFIED ANIMAL CHARCOAL.

Here the earthy salts have been almost entirely removed.

It is prepared by submitting bone-black in powder to the action of hydrochloric acid and water for two days at a moderate temperature, in order to remove the salts, and subsequently heating to redness. It is a black pulverulent substance without odour and almost tasteless; it possesses the

power of absorbing odours and gases, and is consequently much employed for the purification of water.

Therapeutics.—This substance is employed in a similar manner to the vegetable variety. It possesses considerable antidotal power against vegetable poisons, as morphine, aconitine, and strychnine, and nearly all active organic poisons.

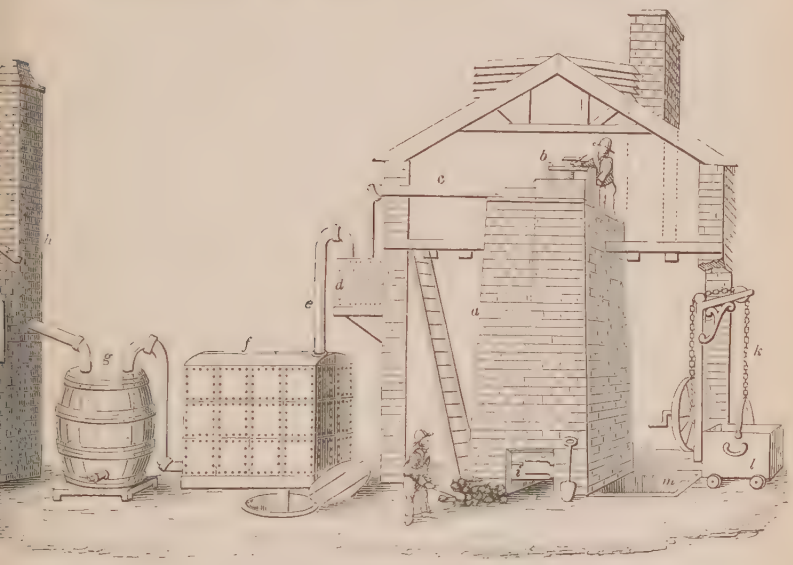


FIG. 20.—Manufactory of animal charcoal.

a, Furnace enclosing the retort; *b*, top of the retort; *c*, pipe to convey away the volatile products; *d*, water cistern through which the volatile matter passes; *e*, pipe leading to *f*, the iron receiver (an old steam boiler), communicating with a reservoir cistern under ground; *g*, second receiver; *h*, chimney into which the residual vapour passes; *i*, furnace door; *k*, crane; *l*, canister to receive the charcoal; *m*, steps leading to the lower end of the retort.

Dose.—As an antacid, a teaspoonful to a tablespoonful; as an antidote, half an ounce or two ounces or more.

CARBONIC ACID. H_2CO_3.

Carbonic anhydride (CO_2) + H_2O = Carbonic acid (H_2CO_3). Is useful in checking vomiting and gastric irritation. It may

be taken advantageously in that form of lithiasis which is attended by phosphatic deposits in the urine.

The best mode of its administration is as carbonic acid water, or in the form of effervescing draughts composed of citric acid and bicarbonate of potassium.

ACIDUM HYDROCYANICUM DILUTUM. DILUTED HYDROCYANIC (PRUSSIC) ACID. HCN.

Hydrocyanic acid, HCN, dissolved in water and constituting 2 per cent. by weight of the solution.

Scheele's prussic acid contains 4 per cent. of anhydrous acid.

Preparation.— By the addition of sulphuric acid to ferrocyanide of potassium and distilled water. Thus :—

$$2K_4FeCy_6 + 3H_2SO_4 = K_2Fe_2Cy_6 + 3K_2SO_4 + 6HCy.$$

Ferrocyanide of potassium and sulphuric acid yield Everitt's yellow salt, sulphate of potassium, and hydrocyanic acid.

The acid should be kept in well-corked bottles tied over with impervious tissue. The bottles, when not in use, should be inverted and kept in a dark place, as the acid is very volatile and liable to decomposition. It can be much longer preserved if a trace of mineral acid be present.

Characters and Tests.—A colourless liquid with a peculiar odour. Only slightly and transiently reddens blue litmus paper. Evaporated on a platinum dish, leaves no fixed residue. Heated with a small quantity of a mixed solution of ferrous and ferric sulphate, afterwards with solution of potash, and finally acidulated with a mineral acid, as hydrochloric or sulphuric, it gives a precipitate of prussian blue. With nitrate of silver it gives a white precipitate of cyanide of silver, soluble in boiling concentrated nitric acid.

The diluted prussic acid should be free from metallic taint, from sulphuric and any foreign acid. 270 grains by weight of the acid, rendered alkaline by the addition of solution of soda, require the addition of 1,000 grain measures of the volumetric solution of nitrate of silver before a permanent precipitate

begins to form, which corresponds to 2 per cent. of the real acid, HCN.

Dose.—2 minims to 8 minims. In the form of a lotion 1 fluid drachm of the diluted acid may be added to 10 ounces of water or rose water; to this lotion *glycerine* is a very useful adjunct, since it retards evaporation. As an ointment, from ½ drachm to 1 drachm to an ounce of zinc ointment.

Official Preparation.—Vapor Acidi Hydrocyanici. Inhalation of Hydrocyanic Acid. 10 to 15 minims of the diluted acid with 1 fluid drachm of *cold* water are mixed in a suitable apparatus, the rising vapour being inhaled.

Therapeutics.—This acid should never be prescribed alone, as it is a very dangerous poison. The effects are the same when the acid is applied to the mucous membranes, or when inhaled in vapour, as when it is received into the stomach. In *medicinal doses*, and much diluted, it is administered for the relief of spasm and pain, and is used in gastrodynia, dyspepsia, pyrosis, and vomiting. It is also useful in nervous cough, and is given in whooping cough and asthma. Chorea, epilepsy, neuralgia, hysteria, and tetanus are stated to have derived benefit from its exhibition. Externally, it is applied to skin affections accompanied by much itching, care being taken that the skin is not abraded. The vapour is sometimes applied to the eye.

GLYCERINUM. GLYCERINE, $C_3H_5(HO)_3$.

This is a sweet principle obtained by the reaction of fats and fixed oils with aqueous fluids, and containing a small percentage of water.

Characters.—A clear, colourless fluid, oily to the touch, without odour, of a sweet taste; freely soluble in water and in alcohol. When decomposed by heat it evolves intensely irritating vapours of *Acrolein*. Possesses great solvent powers, and dissolves borax, carbolic acid, crystallised perchloride of iron, arsenious anhydride, bromine and iodine, and many other substances. It decomposes permanganate and bichromate of potassium. When heated with starch, it forms a "plasma."

When glycerine is acted upon by strong nitric acid, an oily, poisonous, explosive liquid is produced, termed *Trinitrin*, or *Nitro-Glycerine*, or Nobel's "blasting oil."

Glycerine is contained in *Extractum Cinchonæ Liquidum*, in all the *Lamellæ*, in the *Linimentum Potassii Iodidi cum Sapone*, and in a large number of other preparations.

Dose.—10 minims to 2 drachms.

Official Preparations.—

Glycerini Suppositoria.—Glycerine Suppositories. Gelatine is cut small and placed in a weighed evaporating dish with sufficient water to cover it; after allowing it to stand for a minute or two the excess of water is poured away; the whole is set aside until the gelatine is quite soft; glycerine is then added. The mixture is dissolved over a water bath, and evaporated. The product is poured into suppository moulds. Each suppository contains seventy per cent. by weight of glycerine.

The Glycerina.

Glycerinum Acidi Carbolici.—Glycerine of Carbolic Acid (carbolic acid (1), glycerine (4)).

Glycerinum Acidi Gallici.—Glycerine of Gallic Acid (gallic acid (1), glycerine (4)).

Glycerinum Acidi Tannici.—Glycerine of Tannic Acid (tannic acid (1), glycerine (4)).

Glycerinum Aluminis.—Glycerine of Alum (alum in powder (1), glycerine (5)).

Glycerinum Amyli.—Glycerine of Starch (starch (1), glycerine (5), distilled water (3)).

Glycerinum Boracis.—Glycerine of Borax (borax, in powder (1), glycerine (4), distilled water (2)).

Glycerinum Plumbi Subacetatis.—Glycerine of Subacetate of Lead (acetate of lead (5), oxide of lead ($3\frac{1}{2}$), glycerine (20), distilled water (12)). This is used in preparing the *Unguentum Glycerini Plumbi Subacetatis*.

Glycerinum Tragacanthæ.—Glycerine of Tragacanth (tragacanth, in powder (3), glycerine (12), distilled water (2)).

Therapeutics.—Glycerine is demulcent and nutrient; when taken in one or two drachm doses, it is stated to prevent the

formation of wind and acidity. It has been proposed as a substitute for sugar in the treatment of diabetes mellitus, and has been employed as a substitute for cod-liver oil, to which, however, its nutrient properties are far inferior. It is sometimes used as a sweetening agent in the place of syrup.

It is highly esteemed as an external remedy on account of its undrying and soothing properties, and is much used as an adjunct to lotions in skin diseases. 15 grains of isinglass dissolved in 1 ounce of glycerine forms a valuable application in herpes, eczema, and prurigo. It is also an excellent remedy for chilblains.

NITRO-GLYCERINE, $C_3H_5(NO_3)_3$.

This substance is obtained by the action of strong nitric acid upon glycerine.

Official Preparations.—Trinitrinæ Liquor.—Solution of Trinitrin, also known as Liquor Nitroglycerini, Solution of Nitroglycerine, Liquor Glonoini, Solution of Glonoine. It is prepared by dissolving pure nitroglycerine (1 part by weight) in rectified spirit, sufficient to produce 100 fluid parts.

Dose.—$\frac{1}{2}$ to 2 minims.

Nitro-Glycerini Tabellæ.—Tablets of Nitro-glycerine. Tablets of chocolate, each weighing $2\frac{1}{2}$ grains, and containing $\frac{1}{100}$th grain of pure nitro-glycerine.

Therapeutics.—The action of nitro-glycerine somewhat resembles that of nitrite of amyl, but it is far more persistent. Its activity is said to depend upon the nitrous acid generated by decomposition in the body. A dose of $\frac{1}{100}$th grain is absorbed by the stomach unaltered, and, therefore, acts very rapidly.

Favourable results have followed its administration in angina pectoris, neuralgia, epilepsy, asthma, Bright's disease, ague, and sea-sickness. One tablet may be given every three or four hours, or the liquor may be administered on sugar or in a little water.

ALCOHOL ETHYLICUM. ETHYLIC ALCOHOL. ABSOLUTE ALCOHOL. C_2H_5HO.

Preparation.—By dehydrating, *i.e.* depriving of its water, rectified spirit, by means of carbonate of potassium and fused chloride of calcium, and subsequently distilling.

Characters and Tests.—Colourless and free from empyreumatic odour. Containing only 1, or at most 2, per cent. of water. It is entirely volatilised by heat, is not rendered turbid when mixed with water, and does not cause anhydrous sulphate of copper to assume a decided blue colour even when the two have been well shaken together. This test shows its freedom from water.

Use.—It is never administered as a medicine. Is employed as a solvent, and as a test for the purity of some chemical substances, and in the preparation of *Chloroform* and *Liquor Sodii Ethylatis*.

SPIRITUS RECTIFICATUS. RECTIFIED SPIRIT.

Alcohol, C_2H_6O, with 16 per cent. of water; obtained by the distillation of fermented saccharine fluids, and by the rectification of the product when not of the proper density.

Characters and Tests.—Colourless, transparent, very mobile and inflammable, of a characteristic pleasant odour, and a strong spirituous burning taste. Burns with a blue flame without smoke. Remains clear when diluted with distilled water. Odour and taste purely alcoholic. Four fluid ounces with thirty grain-measures of the volumetric solution of nitrate of silver exposed for twenty four hours to bright light, and then decanted from the black powder which has formed, undergoes no further change when again exposed to light with more of the test. These tests are to detect any fousel oil and its quantity.

Therapeutics. A powerful diffusible stimulant employed internally in cases of extreme exhaustion. Externally, it is applied in a diluted state for the production of cold by evaporation, and for the relief of sore nipples. A good evaporating

lotion may be obtained by mixing 1 part of rectified spirit with 2 parts of camphor water.

Spiritus Tenuior. Proof Spirit.—Prepared by the addition of 3 pints of distilled water to 5 pints of rectified spirit. Contains, by weight, about 49 per cent. and, by volume, about 57 per cent. of absolute alcohol.

In the preparation of this substance $2\frac{1}{2}$ per cent. decrease of bulk occurs. Thus :

Rectified spirit, 5 pints (100 ounces) } = { 156 ounces of
Distilled water, 3 pints (60 ounces) } = { proof spirit.

Use.—Rectified spirit is used in pharmacy in the preparation of many tinctures and spirits, when the substances contain a large amount of resin or volatile oil. Proof spirit is employed when these principles are not abundant.

Spiritus Vini Gallici. Spirit of French Wine.—Brandy. Spirit distilled from French wine. Contains from 46 to 56 per cent. of alcohol (by volume), volatile oil and œnanthic ether. It has a peculiar flavour ; is colourless when first distilled, but it generally acquires, in the cask, a light sherry colour ; burnt sugar is often added to colour it.

Official Preparation.—Mistura Spiritus Vini Gallici. Mixture of French Brandy (French brandy, cinnamon water, of each 4 fluid ounces, yolk of two eggs, and refined sugar, $\frac{1}{2}$ ounce).

Therapeutics.—A powerful diffusible stimulant, given in syncope, typhus and typhoid fever, and conditions of exhaustion generally.

Vinum Xericum. Sherry, a Spanish Wine.—Of a pale, yellowish-brown colour. Containing usually from 17 to 18 per cent. of alcohol, colouring matters, œnanthic ether, bitartrate of potassium, malates, and sugar.

Sherry is used in making the following Vina (wines), viz. Vinum aloes ; antimoniale ; colchici ; ferri ; ipecacuanhæ ; rhei.

Cape and other white wines are frequently substituted for sherry.

Therapeutics.—Similar to brandy, but less powerful.

Vinum Aurantii. Orange Wine.—Wine made in Britain, by the fermentation of a saccharine solution to which the fresh peel of the bitter orange has been added.

Characters and Tests.—A vinous liquid, having a golden sherry colour, and a taste and aroma derived from the bitter orange peel. It contains 10 to 12 per cent. of alcohol, and is only slightly acid to test paper.

Official Preparations.—Vinum Ferri Citratis and Vinum Quininæ.

PARALDEHYDUM. PARALDEHYDE. $C_6H_{12}O_3$.

This substance is a product of the polymerisation of ethylic aldehyde (C_2H_4O) by various acids or salts. It may be obtained by treating the aldehyde with diluted sulphuric or nitric acids.

Carbon Compounds are termed "Polymeric" which possess the same percentage composition but differ in their molecular weight. Thus, Ethylene C_2H_4, Propylene C_3H_6, Butylene C_4H_8, and Amylene C_5H_{10}, are polymeric.

In ordinary ethylic aldehyde (C_2H_4O) and paraldehyde ($C_6H_{12}O_3$) it will be observed that the percentage composition of each is the same, but the molecular weight of the latter is three times that of the former.

Characters and Tests. A clear colourless liquid, having a characteristic ethereal odour and a burning and afterwards a cooling taste. It begins to congeal to a clear crystalline mass at 50° Fahr. (10° C.) One part dissolves in ten parts of water at 60° Fahr. (15·5° C.). It is less soluble in hot water. It is miscible, in all proportions, with rectified spirit or with ether. An aqueous solution should have a neutral reaction. It affords no coloration on standing for two hours mixed with a solution of potash or soda, nor any precipitate with a solution of either chloride of barium or nitrate of silver.

Dose.—½ to 1½ fluid drachms.

Therapeutics. Paraldehyde is probably the principal therapeutic agent in the Spiritus Ætheris Nitrosi. Its physiological action resembles that of chloral, but it strengthens the action of the heart, whilst diminishing its frequency. In asylum practice it has been found a useful hypnotic, in doses of 30 to

90 minims acting more quickly than chloral, and producing calm sleep, not followed by headache on waking. It may be employed in cases of heart-disease when chloral would be dangerous, and may be injected either hypodermically or given as an enema. The drug has proved valuable in cardiac asthma, in aortic disease, in delirium tremens, and the delirium of typhoid fever. It is said to be antagonistic to strychnine, and to possess a sedative rather than an anodyne action.

SULPHONAL. SULPHONAL. $C_7H_{16}S_2O_4$.

The actual composition of this substance is Diethylsulphon-dimethyl methane $(CH_3)_2C(SO_2C_2H_5)_2$. It is produced by the oxidation of ethyl mercaptan (C_2H_5HS), and acetone (CH_3COCH_3), water and sulphonal being formed.

$$2C_2H_5HS + CH_3COCH_3 + O_5 = H_2O + C_7H_{16}S_2O_4.$$

A mercaptan is a sulphur alcohol, the oxygen (O) of the alcohol, for example say C_2H_5HO, being replaced by sulphur (S). An acetone is sometimes called a ketone, and is formed by replacing the last H of the acetic aldehyde, CH_3COH, by an alcohol radical, such as methyl (CH_3).

Characters and Tests. Colourless, inodorous, nearly tasteless crystals; neutral to test-paper; slightly soluble in boiling water; very soluble in boiling alcohol. Ignited with free access of air, it burns without residue. If a mixture of a few grains with an equal weight of cyanide of potassium be heated, the odour of mercaptan is evolved, and when to the solution of the product in water excess of hydrochloric acid and a few drops of solution of perchloride of iron are added, a reddish colour is developed.

Dose.—15 to 40 grains.

Therapeutics.—The action of sulphonal is slow, on account of its slight solubility, and, unless in solution, the drug should be given at least an hour before sleep is desirable. It is entirely changed during its passage through the body, the substance formed being stable, but not increasing the elimination of sulphuric acid. It does not disturb the stomach or bowels; and is regarded as a soporific, not affecting digestion, pulse or tem-

perature. The drug has proved efficacious in the sleeplessness of nervous subjects, and has reduced the night-sweats of phthisis, and acted as a sedative in acute maniacal or hysterical delirium and epileptiform convulsions. It has also been found successful in insomnia associated with cardiac or Bright's disease, and when opium is contra-indicated, and in locomotor ataxia. The author has under his care a patient who has taken 20 to 25 grains nightly for many months, obtaining refreshing sleep and experiencing no ill results.

SACCHAROMYCES CEREVISIÆ. BEER YEAST.

CEREVISIÆ FERMENTUM.—Beer Yeast. The ferment obtained in brewing beer, and produced by Saccharomyces Cerevisiæ.

Characters.—Viscid, semifluid, frothy, exhibiting under the microscope numerous isolated, roundish or oval, confervoid

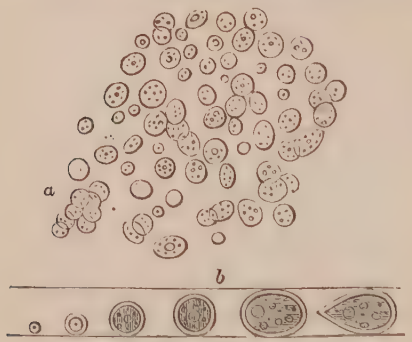


FIG. 21.—Fresh yeast.

a, Cells overlapping and showing their transparency; *b*, Micrometer scale, indicating one-hundredth of a millimeter, with a progressive series of small seeds or seminules, the two first beginning to become vesicular at the centre, the two others showing the thickness of the cells, and their interior small granules of variable size.

FIG. 22. Yeast in wort for one hour. Cells beginning to germinate.

cells, or short-branched filaments composed of united cells. Odour peculiar; taste bitter.

Yeast resembles gluten or albumen; it is, however, in an active condition, and has the power of exciting vinous fermentation in saccharine solutions.

An examination of the changes which yeast undergoes during the fermentation of beer has revealed the following : the fresh yeast had the appearance shown in fig. 21. In one hour after it had been added to the wort, germination had commenced : the maternal cells had produced one or two buds or young cells (fig. 22). In three hours many of the cells were didymous, or double, the buds having attained the size of the maternal cells, and some of them had themselves begun to produce other buds or young cells (fig. 23). In eight hours the cells were arranged in rows, forming moniliform mucedinous plants, composed of several cells or joints, which varied somewhat in shape and diameter. Terminal, and in some cases

FIG. 23.—Yeast in wort for three hours. Cells double or didymous.

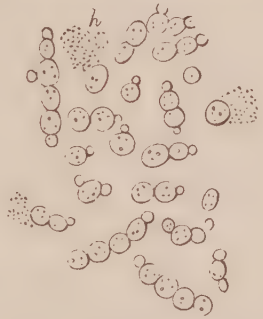


FIG. 24.—Yeast in wort for eight hours. Cells united and converted into moniliform (necklace like) or jointed filaments.

lateral, buds or young cells were observed, showing that the plants were about to ramify. Some of the smaller rows were observed to explode, and emit a fine powder, which consisted of minuter globules (fig. 24). Some yeast cells were placed in an aqueous solution of sugar, and in three days it was seen that jointed filaments, with lateral branches, were produced (fig. 25).

The amylaceous particles contained in the cells of albumen of barley (figs. 26 and 27) have been termed *globuline*. The transformation of these into yeast is said to be the primitive origin of beer yeast.

Dose.—½ to 1 ounce.

Official Preparation.—CATAPLASMA FERMENTI. Yeast Poultice (beer yeast, wheaten flour, and water heated to 100° Fahr. The yeast is mixed with the water, and the flour stirred in. The mass is then placed near the fire until it rises).

Therapeutics.—Externally applied, yeast is stimulant and antiseptic, and is used for indolent ulcers. Internally, it has

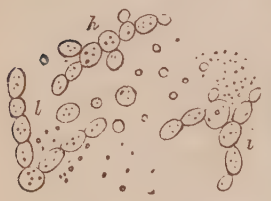


FIG. 25.—Yeast in a saccharine solution for three days.

h, The sporodia beginning to ramify and to evolve lateral buds; *i*, lateral branches composed of two joints; *l*, an individual the cell of which had evolved two branches. The more or less small intermixed cells or granules are probably abortive.

FIG. 26.—Cell from the albumen of barley containing starch grains which have been termed globuline.

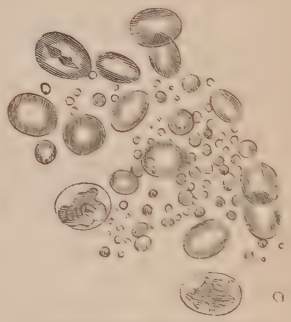


FIG. 27.—Turpin's globuline of barley.

been given in low states of the system. It has been said to prevent the formation of boils and carbuncles. In cases of distension by flatus, yeast enemata have proved serviceable.

ÆTHER. ETHER. SULPHURIC ETHER.

A volatile liquid prepared from alcohol, and containing not less than 92 per cent. by volume of pure ether, $(C_2H_5)_2O$.

Preparation. By the action of sulphuric acid upon rectified spirit, and subsequent distillation by the aid of boiling. As soon as the ethereal fluid commences to pass over, sufficient fresh spirit is supplied to replace the volume that has distilled over. The impure ether formed during the operation is shaken with a mixture of chloride of calcium and slaked lime. After this mixture has been allowed to stand for a short time the supernatant fluid (containing the ether) is poured off and again distilled.

The ether and spirit retained by the chloride of calcium and by the residue of each rectification may be recovered by distillation and used in a subsequent operation.

Here the sulphuric acid acts upon the rectified spirit forming water and sulphovinic acid; the addition of more alcohol to the sulphovinic acid results in the production of sulphuric acid and ether; the temperature must be between 127° C. and 154° C., since above 154° C. olefiant gas (C_2H_4) is produced.

The above is called the *Continuous Etherification Process*, since sulphovinic acid is constantly formed and decomposed, and thus a continuous supply of ether is produced.

Characters and Tests.—A colourless very volatile and inflammable liquid, emitting a strong and characteristic odour. Fifty measures agitated with an equal volume of water are reduced to 45, by an absorption of 10 per cent. It evaporates without residue. A great solvent of iodine, bromine, and corrosive sublimate. Also dissolves fixed and volatile oils, many balsams and resins, and organic vegetable alkaloids. Does not dissolve soda and potash, and thus differs from alcohol. It is contained in *Collodium*, *Collodium Flexile*, *Tinctura Chloroformi et Morphinæ*, and in the three following preparations.

Dose.—20 to 60 minims.

Official Preparation.—Spiritus Ætheris. Spirit of Ether. Ether (1) and rectified spirit (2).

It is contained in *Tinctura Lobeliæ Ætherea*.

Dose.—½ drachm to 1 drachm.

Spiritus Ætheris Compositus. Compound spirit of ether. Hoffmann's anodyne. This is prepared by mixing gradually rectified spirit with sulphuric acid, then subsequently distilling with lime water, removing the supernatant fluid and pouring it into a mixture of rectified spirit and ether. It is a stimulant and anodyne.

Dose.—30 minims to 2 fluid drachms.

Therapeutics.—Ether is a powerful diffusible stimulant, used to correct flatulency, to allay pain and cramp in the stomach, and to relieve spasm in spasmodic asthma, angina pectoris, and hysteria. Applied externally it produces cold by

its rapid evaporation, and is employed in the reduction of herniæ. In the form of vapour it produces an anæsthetic effect not unlike that of chloroform.

ÆTHER PURUS. PURE ETHER.

Ether, $(C_2H_5)_2O$, free from alcohol and water.

Preparation.—Ether is shaken with water, and when the two liquids have separated, the supernatant ether is decanted. The washed ether, together with lime (recently burnt) and chloride of calcium, is placed in a retort to which a receiver is closely attached. The mixture is allowed to stand for twenty-four hours, and then distilled with the aid of a gentle heat.

It should be kept in the dark, as when exposed to light it produces ozone.

Adulterations.—May contain alcohol, water, and sulphurous anhydride.

Spiritus ætheris nitrosi. Spirit of nitrous ether. This contains aldehyde and nitrous compounds, as nitrite of ethyl ($C_2H_5NO_2$). Faintly yellowish, with an apple-like odour.

Preparation.—Nitric acid, sulphuric acid, copper in fine wire, and rectified spirit, are employed. By the action of the nitric acid upon the copper wire nitrous acid is generated, and this, combining with the ether resulting from the action of the sulphuric acid upon the rectified spirit, produces the nitrite of ethyl.

Dose.—$\frac{1}{2}$ drachm to 2 drachms.

Therapeutics.—A stimulant, diaphoretic and diuretic. Used in dropsies and in slight febrile affections.

ÆTHER ACETICUS. ACETIC ETHER. $(C_2H_5,C_2H_3O_2.)$ ACETATE OF ETHYL.

This is a colourless liquid with an agreeable ethereal odour. Obtained by distilling acetate of sodium with rectified spirit and sulphuric acid, then digesting the distilled product with carbonate of potassium, and finally decanting the ethereal fluid.

Water, disulphate of sodium, and acetic ether are formed.

Therapeutics.—A stimulant and anti-spasmodic, similar to sulphuric ether, but less powerful. It is used in preparing the *Liquor Epispasticus.*

Dose.—20 to 60 minims.

CHLOROFORMUM. CHLOROFORM. TERCHLORIDE OF FORMYL. $CHCl_3$.

Preparation.—The following ingredients are employed, viz. Rectified spirit, water, chlorinated lime, slaked lime, sulphuric acid, chloride of calcium, distilled water, and ethylic alcohol. During the process, two strata are produced, the lower of which is crude chloroform, and this is subsequently distilled.

By the action of alcohol on chlorinated lime the results are chloride of calcium, carbonate of calcium, water, carbonic anhydride, and chloroform.

Chloroform should be preserved in a bottle with an accurately ground stopper, and in a cool place.

When exposed to air and light, chloroform is apt to decompose into hydrochloric acid and free chlorine. It is also decomposed by fixed alkalies.

Characters and Tests.—A limpid colourless liquid, of an agreeable ethereal odour, and sweet taste. Dissolves in alcohol and ether in all proportions ; and slightly in water, communicating to it a sweetish taste. Burns, though not readily, with a green and smoky flame. Leaves no residue and no unpleasant odour after evaporation.

Dose.—3 to 10 minims.

Official Preparations.—Aqua Chloroformi. Chloroform Water (1 fluid drachm of Chloroform to 25 ounces of water) = (1 in 200).

Dose.—½ drachm to 2 ounces.

Linimentum Chloroformi. Liniment of Chloroform (equal parts of chloroform and camphor liniment). Faint straw colour.

Spiritus Chloroformi. Spirit of Chloroform (chloroform, 1 ; rectified spirit, 19). Colourless.

Dose.—10 minims to 60 minims.

Tinctura Chloroformi Composita. Compound Tincture of Chloroform (chloroform, 2 ; rectified spirit, 8 ; and compound tincture of cardamoms). Deep lake colour. = (1 in 10).

Dose.—20 to 60 minims.

Tinctura Chloroformi et Morphinæ. Tincture of Chloroform and Morphine. Hydrochlorate of morphine, 8 grains, and oil of peppermint, 4 minims, are dissolved in rectified spirit, 1 ounce ; and to the solution are added, chloroform, 1 ounce, and ether, 2 drachms. Liquid extract of liquorice, 1 ounce, and treacle, 1 ounce, are mixed with syrup, 3 ounces. To the previously formed solution this last mixture is added, and the volume increased to 8 ounces by the further addition of syrup.

Dose.—5 to 10 minims.

Therapeutics.—Internally, in small doses, chloroform is sedative and antispasmodic. Has been given as an antiperiodic in cases where quinine and cinchona have failed. Inhalation of the vapour is made use of in tetanus, hydrophobia, colic, and during the passage of gall stones and renal calculi. It is employed in spasmodic cough, asthma, chorea, lead colic, and hysteria. Externally, it is applied to relieve pain in neuralgia and itching in cutaneous affections, and also as a stimulant to sloughing ulcers and in senile gangrene. Inhaled in small doses, chloroform is slightly inebriant, impairing vision and common sensibility, consciousness remaining. The sensations are often described as pleasurable at first, but if inhalation be continued a dreamy condition follows, and subsequently voluntary motion is lost, the eyes incline upwards, the mental faculties are suspended, the muscles become slightly contracted and the limbs rigid. Finally, there is complete relaxation of the voluntary muscles, the respiration continuing with slight stertorous breathing. The iris is insensible to light and moderately contracted.

Adulterations.—These may be hydrochloric acid and free chlorine, and oily matters formed during its preparation.

IODOFORMUM. IODOFORM. CHI_3.

This substance is the product of the action of iodine upon a mixture of alcohol and solution of potassium carbonate: water, carbonic anhydride, iodide of potassium, formiate of potassium and iodoform resulting.

Characters and Tests.—In shining, lemon-yellow, crystalline scales; somewhat greasy to the touch, and possessing a persistent and disagreeable odour and flavour. Very slightly soluble in water. Heated it first melts to a brown liquid, and then gives off brown and violet vapours. Warmed with an alcoholic solution of potash, and the resulting fluid acidified by nitric acid, iodine is set free.

Dose.—$\frac{1}{2}$ to 3 grains. At least twenty times its weight of mucilage should be used to make it miscible with water. It may also be given in the form of pills, made with equal parts of glucose and treacle.

Official Preparations.—Suppositoria Iodoformi. Iodoform Suppositories (iodoform 36 grains, and oil of theobroma 144 grains). 3 grains of iodoform in each suppository.

When introduced into the rectum or vagina, the suppository blunts sensation.

Unguentum Iodoformi. Ointment of Iodoform (iodoform, 1; benzoated lard, 9).

Therapeutics.—Iodoform is employed in surgical practice for its strong antiseptic properties; it is dusted in fine powder over sloughing sores, chancres, and bed sores. It is also applied to granular lids, and is a valuable remedy for burns. Internally, it has been given in pills for the treatment of phthisis, to relieve the cough and arrest the hectic fever. Its nauseous odour may be covered by Peruvian balsam, musk, or Tonquin bean. The ointment is an excellent application for scabies.

ALCOHOL AMYLICUM. AMYLIC ALCOHOL. FOUSEL OIL. $C_2H_{11}HO$.

This is also called hydrate of amyl. It is an oily liquid, mixed with a small proportion of other spirituous substances,

and is contained in the crude spirit produced by the fermentation of saccharine solutions with yeast, and is separated in the rectification or distillation of such crude spirit.

Characters and Tests.—A colourless liquid, with a penetrating and oppressive odour and a burning taste. Sparingly soluble in water, but soluble in all proportions in alcohol, ether and essential oils. Exposed to the air in contact with platinum black it is slowly oxidised, yielding valerianic acid ($C_5H_{10}O_2$).

It is employed in the preparation of Sodii Valerianas, Valerianate of Sodium, and in the following :—

AMYL NITRIS. NITRITE OF AMYL. $C_5H_{11}NO_2$.

This is an ethereal liquid, with a peculiar odour and yellowish colour. It is produced by the action of nitrous vapours upon amylic alcohol, nitric acid and amyl nitrite being formed.

Characters and Tests. -An ethereal liquid of a yellowish colour, and peculiar not disagreeable odour. Insoluble in water. Soluble in rectified spirit in all proportions. If it be added drop by drop to caustic potash while fused by the application of heat, valerianate of potassium will be formed.

Dose.—By inhalation, 2 to 5 minims, on lint ; internally, $\frac{1}{2}$ to 1 minim dissolved in rectified spirit. It must be used with caution.

Therapeutics. –When inhaled the action of the heart is increased. If continued, convulsions and death may follow. Sugar has been found in the urine several hours after the vapour has been administered. This substance has been inhaled with good results in cases of angina pectoris, in spasmodic asthma, nervous headache, and several forms of neuralgia. It should be given with caution, especially to old persons whose blood-vessels are rigid.

Benzolated Amylic Alcohol is made by mixing together 3 volumes of benzol (C_6H_6) and 1 volume of amylic alcohol ($C_5H_{11}HO$), the supernatant fluid being then decanted from any deposited water. It is used as a test reagent.

CHLORAL HYDRAS. HYDRATE OF CHLORAL.
C_2HCL_3O,H_2O.

Preparation.—CHLORAL is produced by the action of dry chlorine gas upon anhydrous alcohol.

It is then purified by treatment, first with sulphuric acid, and afterwards with lime, being finally converted into the solid hydrate by the addition of water.

Characters and Tests.—In colourless crystals, which do not deliquesce on exposure to air. It has a pungent, but not an acrid odour, and a pungent and rather bitter taste. Soluble in less than its own weight of distilled water, rectified spirit or ether, and in four times its weight of chloroform. A solution in chloroform, when mixed by agitation with sulphuric acid, does not impart colour to the acid.

Dose.—5 to 30 grains.

Official Preparation.—SYRUPUS CHLORAL. Syrup of Chloral (hydrate of chloral, 80 grains; distilled water, 1½ fluid drachms; and simple syrup, to make 1 ounce): 10 grains of chloral hydrate in 1 fluid drachm=(1 grain in 6 minims).

Dose.—½ fluid drachm to 2 fluid drachms.

Therapeutics.—Chloral is a pure hypnotic inducing natural sleep; it is, however, far inferior as an anodyne to opium and morphine. It is very useful in the treatment of delirium tremens, acute mania, and severe chorea, and may be beneficially employed to relax the spasms in tetanus and strychnine poisoning. In cases where opium is inadmissible, chloral has been found of great benefit; and much relief has been obtained from its administration in asthma and whooping-cough, and in the nocturnal sleeplessness of pulmonary phthisis. Dangerous symptoms of cardiac depression are at times occasioned by a full dose of chloral hydrate. Considerable excitement may be caused if sleep has not been produced. Profound melancholy, feebleness of the will, accompanied by languor and debility, are some of the evils ensuing from the habitual use of this drug. The nauseous taste may be disguised by syrup of orange-peel or syrup of tolu. Hydrate of chloral is decomposed by alkalies into chloroform and a formiate of the base.

Hydrate of chloral with liquor potassæ yields formiate of potassium, water, and chloroform.

BUTYL CHLORAL HYDRAS. ($C_4H_5Cl_3O,H_2O$.)

This substance was formerly known, although erroneously, as "Croton-Chloral Hydrate." It is produced by the action of dry chlorine gas on aldehyde (C_2H_4O), cooled to a temperature of 14° Fahr., separated by fractional distillation, and converted into the solid hydrous butyl-chloral by the addition of water. Hydrochloric acid, oxygen, and butyl chloral are produced during the process.

Characters and Tests.—In pearly-white crystalline scales, having a pungent, but not acid odour, resembling that of chloral hydrate, and an acrid nauseous taste. Soluble in about 50 parts of water, in its own weight of glycerine and rectified spirit, and nearly insoluble in chloroform. It does not yield chloroform on heating with solutions of soda or potash, or with milk of lime.

Dose.—5 to 15 grains.

Therapeutics.—An hypnotic resembling chloral hydrate, but not so powerful, and produces less cardiac depression, exerts a specific anæsthetic or anodyne action upon the branches of the fifth nerve, and therefore is very useful in facial neuralgia.

It is best administered in the form of pill with mucilage, or dissolved in water and glycerine.

CREASOTUM. CREASOTE.

A product of the distillation of wood tar.

Characters and Tests.—A liquid, colourless, or with a yellowish tinge, and a strong empyreumatic odour. Sparingly dissolved by water, but freely by alcohol, ether, and glacial acetic acid. It turns the plane of polarisation of a ray of polarised light to the right. An aqueous solution (1 per cent.) gives, with a drop of a diluted neutral solution of ferric chloride, a green coloration, changing speedily to a reddish-brown, and yields a reddish-brown precipitate, unless the mixture is much diluted.

Dose.—1 to 3 minims, diluted with weak mucilage, or in a pill with crumb of bread ; as a gargle, ½ drachm to 1 ounce of water.

Official Preparations.—Mistura Creasoti. Creasote Mixture (creasote, glacial acetic acid, spirit of juniper, syrup and distilled water ; 1 minim in 1 ounce of the mixture). = (1 in 516).

Dose.—1 to 2 fluid ounces.

Unguentum Creasoti. Creasote Ointment (creasote and simple ointment). Cream colour = (about 1 in 9).

Vapor Creasoti. Inhalation of Creasote (creasote, 12 minims, and boiling water, 8 fluid ounces, mixed in a suitable apparatus for allowing air to pass through the solution).

Therapeutics.—Internally, in small doses, creasote is a stimulant to the stomach. It has been used in certain forms of vomiting, and sometimes in diarrhœa, in chronic gonorrhœa and gleet, and in toothache dependent upon caries. It allays the craving for food and the thirst in diabetes mellitus. It is employed as a local application to ulcers and chronic skin disorders ; as a topical styptic in hæmorrhages, and as a gargle in mercurial salivation. The vapor is useful in chronic bronchitis with excessive expectoration, and for correcting the fœtor of the sputa in dilatation of the bronchi, in pulmonary abscess and gangrene.

Incompatibles.—When mixed with the oxide of silver, heat is given off, and even flame is produced.

ACETUM. VINEGAR.

An acid liquid, prepared from a mixture of malted and unmalted grain by the acetous fermentation.

Characters and Tests.—A liquid of a brown colour and peculiar odour. 445·4 grains by weight (1 fl. ounce) of it require at least 402 grain-measures of the volumetric solution of soda for their neutralisation, corresponding to 5·41 per cent. of real acetic acid, $HC_2H_3O_2$. If 10 minims of solution of chloride of barium be added to a fluid ounce of the vinegar, and the precipitate, if any, be separated by filtration, a further addition of the test will give no precipitate.

The constituents of vinegar are acetic acid, acetic ether, colouring matter, gluten, and a trace of sulphuric acid; of this last substance $\frac{1}{1000}$ part only is by law allowed by the revenue.

Any liquid which is susceptible of vinous fermentation may be made to yield vinegar; the presence of some substance capable of producing sugar, such as diluted spirit and beer, is the essential ingredient; this is converted by the fermentative process first into alcohol and finally by oxidation into acetic acid.

In this country, commercial vinegar is obtained from an infusion of malt, or of a mixture of raw barley and malt, but in the wine countries it is procured from inferior wines; either red or white wine, producing either the red or white vinegar. The white wine vinegar is usually preferred, since it keeps better.

Dose.—1 drachm to 1 ounce.

Vinegar is used in the preparation of

Emplastrum Saponis Fuscum, Brown Soap Plaster; prepared from curd soap in powder, yellow wax, olive oil, oxide of lead, and vinegar.

Adulterations.—Sulphuric acid may be added, and metallic impurities, as lead or copper, may be present, derived from the vessel in which the vinegar is preserved.

Therapeutics.—Produces the same action as that of acetic acid of equal strength.

ACIDUM ACETICUM. ACETIC ACID. PURIFIED PYROLIGNEOUS ACID.

An acid liquid prepared from wood by destructive distillation, and subsequently purified. 100 parts by weight contain 33 parts of real acetic acid, $HC_2H_3O_2$.

An impure pyroligneous acid is obtained by distilling hard woods, as the oak, beech, ash, and birch. Sometimes the still is a cast-iron cylinder placed horizontally in a furnace, the fire of which plays around the cylinder (fig. 28).

Characters and Tests.—A colourless liquid having a strong acid reaction and a pungent odour. It gives a *cherry-red* colour with a neutral solution of perchloride of iron.

Impurities.—These may be metallic salts, sulphuric, hydrochloric, and sulphurous acids, and empyreumatic substances.

Acetic acid is used in a large number of preparations.

Acidum Aceticum Dilutum. Diluted Acetic Acid (acetic acid, 1 pint; and distilled water, 7 pints). One fluid ounce contains nearly 19 grains of real acetic acid.

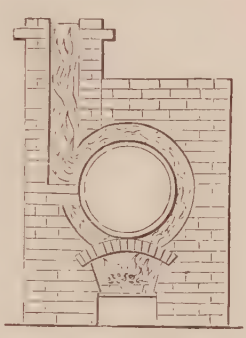


FIG. 28.—Section of a pyroligneous acid still.

Dose.—1 drachm to 1 ounce.

Used in the preparation of *Acetum Scillæ* and *Liquor Morphinæ Acetatis.*

Therapeutics.—Acetic acid acts as a refrigerant when taken internally, but it is seldom used for this purpose. Externally, in the strong form, it is used as a rubefacient, sometimes as a vesicant and escharotic. The glacial acid is, however, more effectual for such purposes. When much diluted, it may be used for sponging the surface in fevers, to check excessive sweating, and also as a soothing lotion. It is more frequently employed on account of its solvent powers.

Acidum Aceticum Glaciale. Glacial Acetic Acid (concentrated acetic acid, containing nearly 99 per cent. of real acid $HC_2H_3O_2$). It is 3 times as strong as Acidum Aceticum, and nearly 20 times as strong as Acidum Aceticum Dilutum.

This is a colourless liquid with a pungent acetous odour; it crystallises when cool.

Glacial acetic acid is used in the preparation of *Acetum Cantharidis*, *Mistura Creasoti*, and *Linimentum Terebinthinæ Aceticum.*

Therapeutics.—A caustic, irritant, vesicant, and escharotic, chiefly used for external application to warts and corns.

ACIDUM BENZOICUM. BENZOIC ACID. $HC_7H_5O_2$.

An acid obtained from benzoin, and prepared by sublimation. Not chemically pure.

Characters and Tests.—In light feathery crystalline plates and needles, which are flexible, nearly colourless, and have an agreeable aromatic odour, resembling that of benzoin. It is sparingly soluble in water, but is readily dissolved by rectified spirit; soluble also in solutions of the caustic alkalies and of lime, forming benzoates.

Dose.—10 to 15 grains.

It is contained in *Ammonii Benzoas*, *Tinctura Camphoræ Composita*, *Tinctura Opii Ammoniata*, and *Trochisci Acidi Benzoici*.

Therapeutics.—A stimulant to the mucous membrane of the bladder, acting as an alterative in chronic inflammation of this viscus. It is also stated to cure incontinence of urine. It is also used as an expectorant.

ACIDUM CARBOLICUM. CARBOLIC or **PHENIC ACID.** HC_6H_5O.

An acid obtained from coal-tar oil by fractional distillation and subsequent purification.

Characters and Tests.—In colourless acicular crystals, or in faintly reddish crystalline masses, which at a temperature of 91·50° Fahr. become an oily liquid, having a strong odour and taste, resembling those of creasote. Freely soluble in alcohol, ether, and glycerine, or glycerine and water. It does not redden blue litmus paper. It does not affect the plane of polarisation of a ray of polarised light. The pure acid is supplied in three states, the glacial, granular, and liquid; the last is made by mixing 9 parts of acid with 1 part of water.

Tests.—Its characteristic odour; coagulates albumen; does not redden blue litmus paper; gives a deep purple colour with neutral solution of the perchloride of iron, and the same colour with solution of ammonia and of chlorinated soda.

Official Preparations.—Glycerinum Acidi Carbolici. Glycerine of Carbolic Acid (4 ounces of glycerine to 1 ounce of carbolic acid). A thick colourless liquid.

Suppositoria Acidi Carbolici cum Sapone. Carbolic Acid and Soap Suppositories (carbolic acid, curd soap, and starch). 1 grain of carbolic acid in each.

Unguentum Acidi Carbolici. Ointment of Carbolic Acid (carbolic acid, 1 ; soft paraffin, 12 ; hard paraffin, 6).

Therapeutics.—This acid acts upon the skin and other parts as a powerful stimulant and even caustic. It is also antiseptic. Is employed to correct the fœtor of gangrenous and offensive sores, and for the removal of putrid odours. It is also valuable in caries and necrosis ; and may be applied to carbuncles, lupus, &c., or used for the destruction of hæmorrhoids. Internally, it may be given for the same objects as creasote ; it is useful in gastric affections accompanied by offensive eructations, rapidly arrests fermentation, and destroys sarcinæ. Has been given in whooping-cough. When incautiously inhaled or applied to a large extent of surface, poisonous symptoms may arise, such as nausea, vomiting, feeble pulse, and even coma and convulsions. As an external application to ulcers, lacerated wounds, burns and scalds, 1 part of the acid should be mixed with 20 parts of water.

Dose.—1 to 3 grains.

Acidum Carbolicum Liquefactum. Liquefied Carbolic Acid. Carbolic acid liquefied by the addition of 10 per cent. of water.

Characters and Tests.—A colourless or very slightly reddish or brownish liquid, with the taste and odour of carbolic acid. Dissolves 18 to 26 per cent. of water at 60° Fahr., yielding a clear or nearly clear solution, from which any previously contained impurity in the acid (slight coloured) separates as dark oily drops.

ACIDUM SULPHOCARBOLICUM. SULPHOCARBOLIC ACID. $HC_6H_5SO_4$.

Sulphophenic or phenyl-sulphuric acid is produced by the action of strong sulphuric acid on carbolic acid by the aid of

heat. It is introduced in medicine in combination with bases, as the sulphocarbolates of sodium and of zinc, which are said to possess the medicinal properties of carbolic acid, while being free from its strong odour.

Phenol-Phthalein.—This substance is produced by the reaction of phenol or carbolic acid ($C_6H_5(HO)$) and phthalic anhydride ($C_8H_4O_3$), a substance formed together with oxalic acid ($H_2C_2O_4$) by the prolonged action of nitric acid upon naphthalin ($C_{10}H_8$), which becomes oxidised thus :

$$C_{10}H_8 + 8O = H_2C_2O_4 + H_2C_8H_4O_4 \text{ (phthalic acid).}$$

On heating phthalic acid, the phthalic anhydride sublimes.

PHENOL-PHTHALEIN TINCTURE.—1 grain of phenol-phthalein is dissolved in 500 grains of proof spirit ; the solution should be colourless.

This tincture yields an intense red colour with potash and soda, and thus may be used as an indicator of the termination of volumetric reactions, especially those with organic acids. By adding excess of an acid the red colour is immediately destroyed. It is not suitable for the estimation of ammonia.

ACETANILIDUM. ACETANILIDE. C_8H_9NO.

The composition of this substance is really Phenyl-acetamide, $C_6H_5NH.C_2H_3O$. It is built upon a molecule of ammonia $\left.\begin{matrix}H\\H\\H\end{matrix}\right\}N$, in which two atoms of hydrogen are replaced by the monad radicals phenyl C_6H_5, and acetyl C_2H_3O respectively. Thus : $\left.\begin{matrix}C_6H_5\\C_2H_3O\\H\end{matrix}\right\}N$. An amide is a substance which is built up on the molecule of ammonia $\left.\begin{matrix}H\\H\\H\end{matrix}\right\}N$, and in which one atom of hydrogen is replaced by a monad acid radical, such as acetyl C_2H_3O, the radical of acetic acid, $HC_2H_3O_2$. Thus

$$\left.\begin{matrix} C_2H_3O \\ H \\ H \end{matrix}\right\} N, \text{ or } C_2H_3OH_2N = \text{acetamide.}$$

Acetic acid is built upon the molecule of water $\left.\begin{matrix} H \\ H \end{matrix}\right\} O$, in which one atom of hydrogen is replaced by C_2H_3O, thus: $\left.\begin{matrix} C_2H_3O \\ H \end{matrix}\right\} O$. The substance H_2N is a monad, and is termed amidogen.

Acetanilide is a crystalline substance, commonly known as "Antifebrin"; it may be obtained by the action of glacial acetic acid on aniline, and subsequent purification.

Characters and Tests.—Colourless, glistening, scaly crystals, having a slightly pungent taste and neutral reaction. It is soluble in about 200 parts of cold water; freely soluble in rectified spirit, ether, benzol, and chloroform.

Heated with free access of air, it burns, leaving no residue. With sulphuric acid it forms a colourless solution. Heated with solution of potash and a few drops of chloroform, the unpleasant odour of phenyl-isonitrile is developed.

Dose.—3 to 10 grains.

Therapeutics.—Acetanilide is febrifuge, anti-pyretic, anti-epileptic, anti-arthritic, a hypnotic sedative, and nervine tonic. It has been given in delirium tremens, and is stated to check the chills and fever of phthisis, and relieve the darting pains of locomotor ataxia. It has been recommended for diphtheria and scarlatinal and other forms of sore-throat, and also in the treatment of epilepsy. It has been found useful as a local application in psoriasis, erysipelas, and acne (twenty grains to an ounce of lanoline or vaseline). It is considered to be a valuable hypnotic for children.

GLUSIDUM. GLUSIDE.

This substance is also called Glucusimide; Benzoyl-sulphonic imide, $C_6H_4CO.SO_2NH$, or $\left.\begin{matrix} C_6H_4CO\,SO_2 \\ H \end{matrix}\right\} N$, and is commonly known as "Saccharin."

It is a sweet imide derivable from the toluene of coal-tar.

An imide is a substance built upon the molecule of ammonia, $\left.\begin{matrix}H\\H\\H\end{matrix}\right\}N$, and in which two atoms of hydrogen are replaced by a dyad radical, as, for instance, Succinimide, $\left.\begin{matrix}C_4H_4O_2\\H\end{matrix}\right\}N$. Here the dyad radical Succinyl, $C_4H_4O_2$, replaces two atoms of monad hydrogen. Succinic acid, $H_2C_4H_4O_4$, is built upon two molecules of water, $\left.\begin{matrix}H_2\\H_2\end{matrix}\right\}O$, thus $\left.\begin{matrix}C_4H_4O_2\\H_2\end{matrix}\right\}O_2$. The substance HN is dyad and is termed Imidogen.

Characters and Tests.—A light, white, minutely crystalline powder, having an intensely sweet taste in diluted solutions. Heated, it fuses and then sublimes with partial decomposition. It is but slightly soluble in cold water or chloroform, more so in boiling water, rectified spirit, or glycerine. It is very soluble in diluted solution of ammonia ; also in solution of bicarbonate of sodium with evolution of carbonic acid gas. The latter solution, when warmed and made neutral and evaporated to dryness, yields "soluble gluside" or "soluble saccharin," which is very soluble in water, one hundred parts of gluside yielding nearly one hundred and thirteen of neutral "soluble gluside." Neither gluside nor soluble gluside is blackened by strong sulphuric acid, even when the mixture is gently warmed for a short time. On evaporating either with excess of strong solution of soda, dissolving in water, faintly acidulating with hydrochloric acid, and adding a few drops of solution of perchloride of iron, a reddish-brown or purplish colour is produced.

Therapeutics.—The sweetening power of gluside is said to be 100 times greater than sugar. It is possible to detect 1 grain in a gallon of distilled water. In diluted solution its sweetness bears a strong resemblance to that of sugar, but is more persistent. It is used to disguise the taste of nauseous drugs (2 grains to 8 ounce mixture), as cascara sagrada, nux vomica, strychnine, salicin, and sodium salicylate. Is considered to be a valuble substitute for sugar in cases of diabetes mellitus, but is apt to occasion dyspeptic symptoms if given in

excess, and the sweet taste may become persistent. It has also been given to arrest the decomposition of urine in chronic cystitis.

PHENACETINUM. PHENACETIN. $C_{10}H_{13}NO_2$.

This is a crystalline substance produced by the action of glacial acetic acid on para-phenetidin, a body obtained from phenol.

Phenacetin has also been called Para-acet-phenetidin. It is an acetyl compound of phenetidin (the ethylic ether of a substance known as Paramidophenol), and is analogous with acetanilidum or antifebrin.

Characters and Tests.—Colourless, tasteless, inodorous, glistening scaly crystals. Sparingly soluble in cold water, more freely in boiling water, and in about sixteen fluid parts of rectified spirit.

Heated with free access of air it burns, leaving no residue. Sulphuric acid dissolves it without colour. Boiled with hydrochloric acid and diluted with water, it assumes a deep-red coloration with solution of chromic acid.

Dose.—5 to 10 grains.

Therapeutics.—Phenacetin reduces temperature and soothes pain, causing no rash or cyanosis. It has been successfully employed in rheumatism, neuralgia, and hysteria, and has been recommended in cases of whooping-cough. Doses of four to eight grains reduced the temperature in cases of pyrexia, but the effects were only of short duration. Combined with citrate of caffeine, it has relieved sick headache.

PHENAZONUM. PHENAZONE.

This substance is really Phenyl-dimethyl-pyrazolone, $C_6H_5(CH_3)_2C_3HN_2O$, and is commonly known as "Antipyrine."

It is a crystalline substance obtainable from phenyl-hydrazine.

Characters and Tests.—Colourless and inodorous scaly crystals with a bitter taste, freely soluble in water, rectified spirit, and chloroform ; less soluble in ether. Ignited with free access of air, it burns, leaving no residue. The aqueous solution is neutral to test-paper, and is not affected by sulphuretted hydrogen. One grain of nitrite of sodium and two fluid drachms of a one per cent. aqueous solution of phenazone yield a nearly colourless liquid which turns deep green on the addition of ten minims of diluted sulphuric acid. An aqueous solution of the same strength mixed with an equal volume of nitric acid assumes a yellow colour, passing to crimson on warming. Solution of perchloride of iron produces in a very diluted aqueous solution a deep-red colour, which is nearly discharged by excess of diluted sulphuric acid.

Dose.—3 to 20 grains.

Therapeutics.—Phenazone is analgesic, febrifuge, and hæmostatic ; it reduces the temperature of fevers and the pyrexia of pneumonia and pleurisy. Also relieves locomotor ataxia, neuralgia, sea-sickness, and chorea. It has been employed hypodermically in cases of lumbago, sciatica, angina pectoris, renal and biliary calculi, and also in dysmenorrhœa. It use has been followed by a measly rash. Its taste may be disguised by peppermint water or essence. It is said to allay the pains of labour, and to check nocturnal emissions, and also to reduce the amount of sugar in diabetes mellitus. It has checked hæmoptysis, but failed to arrest the bleeding of wounds. Diminishes the quantity of urine, of total urinary solids, urea and chlorides, and increases uric acid. In some cases dangerous effects have resulted from its administration, and it is apt to cause cyanosis. It may be administered as an enema.

With regard to the coal-tar antipyretics, it has been stated that phenazone (antipyrine) is the best as regards rapidity, efficacy, and certainty of action ; phenacetin, as regards safety and duration of effects, no subnormal temperature or collapse having been produced. They all cause profuse perspiration, but do not shorten attacks of fever. Phenacetin alone exerts a soothing and soporific action.

Incompatibles.—Spirit of nitrous ether, or other nitrites, in the presence of free acid, lead to the formation of an apparently inert bluish-green compound. The cinchona alkaloids form with phenazone a precipitate soluble in weak acids; with chloral hydrate a crystalline compound is formed which is therapeutically inactive.

ACIDUM CITRICUM. CITRIC ACID. $H_3C_6H_5O_7$, H_2O.

An acid prepared from lemon-juice, or from the juice of the fruit of Citrus Bergamia, the Lime.

Preparation.—By boiling the lemon-juice and adding prepared chalk (carbonate of calcium), then decomposing the resulting citrate of calcium by means of sulphuric acid.

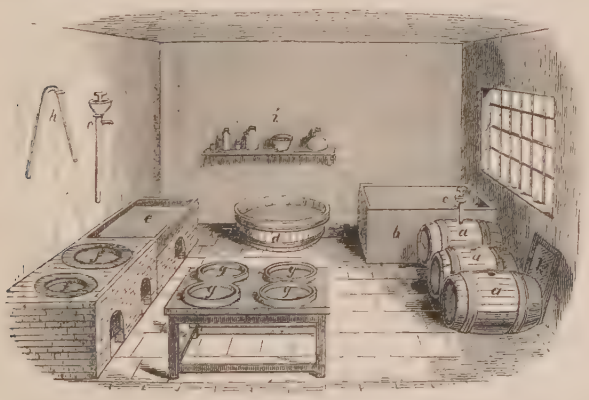


FIG. 29.—Citric acid manufactory.

a, *a*, *a*, casks of lemon juice; *b*, wooden vat for saturating the juice with chalk; *c*, *c*, copper pumps; *d*, decomposing tub for the citrate of calcium and sulphuric acid; *e*, leaden boiler; *f*, *f*, finishing leaden boilers; *g*, crystallising pans; *h*, leaden syphon for running off the waste liquor from the vat *b*; *i*, chemical tests; *k*, moveable strainer for clearing the mother liquors.

A citric acid manufactory is shown in fig. 29.

Characters and Tests.—In colourless crystals, consisting of rhomboidal prisms, the extremities of which are terminated by four trapezoidal faces (fig. 30); very soluble in water, less

soluble in rectified spirit, and insoluble in pure ether. The diluted aqueous solution has an agreeable acid taste. When the solution is made by dissolving about 40 grains of the acid in 1 ounce of water, it resembles lemon-juice in strength and in the nature of its acid properties, and, like lemon-juice, it undergoes decomposition and becomes mouldy by keeping. With excess of lime water, and boiled, it gives a white precipitate of citrate of calcium. The crystals leave no ash when burned with free access of air.

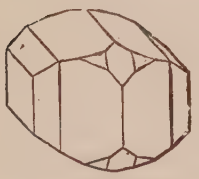


FIG. 30. -Citric acid.

Dose.—10 to 30 grains.

Therapeutics.—Acts internally as a refrigerant, allaying thirst and irritation of the skin.

The free acid is contained in VINUM QUININÆ, SUCCUS LIMONIS, and SYRUPUS LIMONIS.

Adulterations.—Traces of metallic salts, oxalic, tartaric, or sulphuric acids.

ACIDUM GALLICUM. GALLIC ACID. $H_3C_7H_3O_5$, H_2O.

Preparation.—By boiling powdered galls with diluted sulphuric acid, and while hot straining through calico. On cooling, the deposited crystals are purified with animal charcoal.

Characters and Tests.—Crystalline, in acicular prisms or silky needles, sometimes nearly white, but generally of a pale fawn-colour. It requires about 100 parts of cold water for its solution, but dissolves in 3 parts of boiling water. The aqueous solution gives no precipitate with solution of isinglass (thus distinguished from tannic acid). It gives a bluish-black precipitate with a persalt of iron. It leaves no residue when burned with free access of air.

Dose.—2 to 10 grains in solution in powder or in pill.

Therapeutics.—Astringent, given in internal hæmorrhage.

Official Preparation.—GLYCERINUM ACIDI GALLICI. Glycerine of Gallic Acid (gallic acid, 1 ; glycerine, 4). Yellow.

ACIDUM TANNICUM. TANNIC ACID. $C_{27}H_{22}O_{17}$.

Preparation.—By exposing powdered galls to a damp atmosphere for two or three days, and adding sufficient ether to form a soft paste, pressing the mixture, and finally evaporating the liquid squeezed out.

Characters and Tests.—In pale yellow vesicular masses or thin glistening scales, with a strongly astringent taste, and an acid reaction ; readily soluble in water. The aqueous solution precipitates solution of gelatine yellowish-white, and the persalts of iron of a bluish-black colour. It leaves no residue when burned with free access of air.

Dose.—2 to 10 grains.

Official Preparations.—GLYCERINUM ACIDI TANNICI. Glycerine of Tannic Acid (tannic acid, 1 ; glycerine, 4). Brownish-yellow.

SUPPOSITORIA ACIDI TANNICI. Tannic Acid Suppositories (tannic acid and oil of theobroma) ; 3 grains of tannic acid in each suppository.

SUPPOSITORIA ACIDI TANNICI CUM SAPONE. Tannic Acid and Soap Suppositories (tannic acid, glycerine of starch, curd soap in powder, starch in powder) ; 3 grains of tannic acid in each.

TROCHISCI ACIDI TANNICI. Lozenges of Tannic Acid (tannic acid, tincture of tolu, sugar, gum acacia, mucilage of gum acacia, and distilled water) ; $\frac{1}{2}$ grain in each lozenge. Light fawn colour.

Therapeutics of Gallic and Tannic Acids.—Tannic acid, when applied to a living part, is a powerful astringent. It is partly thrown out by the kidneys as gallic and pyrogallic acids. Gallic acid is less astringent than tannic acid, perhaps because it is comparatively less soluble. After absorption, its remote effects are the same as those of tannic acid. These acids may be given in hæmaturia, hæmoptysis, and menorrhagia ; in diarrhœa and dysentery, or in any case where there is increased discharge of mucus, and in order to check excessive sweating. The compounds of gallic or tannic acids may be used for

staying hæmorrhage from the nose, gums, and other parts ; or to diminish such discharges as gleet, and the bleeding from hæmorrhoids and also in leucorrhœa.

ACIDUM OXALICUM. OXALIC ACID. $H_2C_2O_4,2H_2O$.

A white crystalline acid prepared by the action of caustic potash upon sawdust (oxalate of potassium being formed), and the subsequent addition of lime and sulphuric acid with the production of sulphate of calcium and oxalic acid.

Merely used as a test reagent.

Tests.—Nitrate of silver gives a *white* precipitate of oxalate of silver, soluble in cold nitric acid. The oxalate of silver, when heated upon platinum foil, is decomposed with detonation, leaving metallic silver behind.

Sulphate of calcium gives a *white* precipitate of oxalate of calcium.

ACIDUM TARTARICUM. TARTARIC ACID. $H_2C_4H_4O_6$.

Preparation.—By neutralising a strong solution of acid tartrate of potassium with chalk (carbonate of calcium), then adding chloride of calcium, and treating the resulting tartrate of calcium with sulphuric acid, evaporating and purifying the crystals.

A precipitate of tartrate of calcium is produced first by the chalk, neutral tartrate of potassium remaining in solution : the neutral tartrate is precipitated by chloride of calcium, a second portion of tartrate of calcium falling. The whole precipitate of tartrate of calcium is decomposed by the sulphuric acid, sulphate of calcium and tartaric acid being formed.

Characters and Tests.—In colourless crystals, consisting of elongated imperfectly transparent prisms (figs. 31 and 32). It has a strongly acid taste, and is readily soluble in water. When, to the solution, not too much diluted, a little acetate of potassium is added, a white crystalline precipitate of bitartrate of potassium (thus distinguished from all other acids) is formed.

It leaves no residue, or only a mere trace, when burned with free access of air.

Dose.—10 to 30 grains or more in water.

Therapeutics.—Tartaric acid acts in a similar manner to citric acid, and is used as a refrigerant. It is usually administered in the form of cream of tartar (acid tartrate of potassium), combined with bicarbonate of sodium, in a state of effervescence.

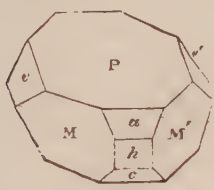


FIG. 31.—The crystal is usually modified. The corresponding planes in both figures are marked with the same letters.

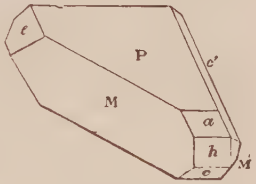


FIG. 32.—The same modified form, with the planes irregularly disposed, as they appear in most of the crystals.

Crystals of tartaric acid.

Adulterations.—Acid tartrate of potassium and alum have been sometimes added. It may contain traces of metallic salts, oxalic acid, sulphuric acid (from imperfect preparation), and lime.

ACIDUM LACTICUM, LACTIC ACID. $HC_3H_5O_3$.

This acid contains about 25 per cent. of water. It is produced by the action of a peculiar ferment on solution of sugar, and subsequent purification of the product.

Characters and Tests.—A colourless syrupy liquid, inodorous, with a pure acid taste, and acid reaction on litmus. Miscible in all proportions with water.

It gives out the odour of aldehyde when warmed with potassium permanganate.

Adulterations.—These may be lead or iron, sulphates, chlorides, calcium, or sugars.

Acidum Lacticum Dilutum. Diluted Lactic Acid is prepared from lactic acid, 3 parts, and distilled water sufficient to produce 20 parts.

800 grains by weight require for neutralisation 1,000 grain measures of the volumetric solution of soda.

Dose.—½ to 2 fluid drachms.

Therapeutics.—The strong acid has been employed as a spray in diphtheria (1 part in 16 of water).

It has also been used as a plaster combined with powdered silicic acid (in equal parts) for the destruction of lupus. The diluted acid is given in diabetes, catarrh of the bladder, and in atonic dyspepsia.

ACIDUM OLEICUM. OLEIC ACID. $HC_{18}H_{33}O_2$.

A fluid, fatty acid, obtained by the saponification of olein, or by the action of superheated steam on fats with the subsequent separation from solid fats by pressure. It is usually not quite pure.

Characters and Tests.—A straw-coloured liquid, nearly odourless and tasteless, and with not more than a very faint acid reaction. Becomes brown and decidedly acid when unduly exposed to air. Insoluble in water. It may contain traces of stearic and palmitic acids.

Uses.—It is only used for making Oleatum Hydrargyri, Oleatum Zinci, and Unguentum Zinci Oleati. The oleates are used for external applications to eczema, intertrigo, warts, and corns. Oleic acid dissolves most of the metallic oxides.

ACIDUM SALICYLICUM. SALICYLIC ACID. $HC_7H_5O_3$.

This is a crystalline acid, obtained by the combination of the elements of carbolic acid (HC_6H_5O) with those of carbonic acid gas (CO_2), and subsequent purification, or from natural salicylates such as the oils of wintergreen (Gaultheria procumbens) and sweet birch (Betula lenta).

The CO_2 is passed into a mixture of HC_6H_5O and caustic soda (NaHO) at a high temperature. The resulting salicylate of sodium ($NaC_7H_5O_3$) is then decomposed with an acid.

The oil of wintergreen, which is chiefly composed of salicylate of methyl, is heated with caustic potash and distilled; the

residue (salicylate of potassium) is then decomposed with hydrochloric acid, and the salicylic acid purified by recrystallisation.

Characters and Tests.—In white acicular crystals, inodorous but light and easily diffused, and then irritating to the nostrils. The taste is at first sweetish and then acid. Soluble in 500 to 700 parts of water at ordinary temperatures. An aqueous solution yields a reddish-violet colour with solution of perchloride of iron. An alcoholic solution allowed to evaporate spontaneously should leave a perfectly white residue.

Dose.—5 to 30 grains.

Therapeutics.—A powerful antiseptic and antiferment, very valuable in surgical dressing, and used in the form of wadding, lint, or ointment. It may be also employed as a lotion, and as a local application in diphtheria. A solution of salicylic acid and collodion (1 in 2) rapidly destroys corns and warts.

The internal effects of salicylic acid somewhat resemble quinine. It is useful in febrile diseases, and specially in acute rheumatism. Large doses exert a poisonous influence upon the heart and the respiration.

The drug appears in the urine as long as 50 hours after being taken, partly as salicylic acid, and partly, it is said, as salicyluric acid.

It has been given in small doses for the relief of headache, and in larger doses for phlegmasia alba dolens, and has proved serviceable in the treatment of Menière's disease. It is frequently employed for the reduction of high temperature.

Official Preparations.—Unguentum Acidi Salicylici. Ointment of salicylic acid (salicylic acid 1; soft paraffin 18; hard paraffin 9) melted together. Yellowish or white.

Salicylic acid is also used in the form of Sodii Salicylas.

PARAFFINUM DURUM. HARD OR SOLID PARAFFIN.

This is a mixture of several of the harder members of the paraffin series of hydrocarbons. It is usually obtained by distillation from shale, the liquid oils being separated by refrigeration and the solid product purified.

Characters and Tests.—Colourless, semitransparent, crystalline, tasteless and inodorous, slightly greasy to the touch. It burns with a bright flame, leaving no residue.

Uses.—The hard paraffin is used in preparing the following : the ointments of boric, carbolic, and salicylic acid, and those of eucalyptus, glycerine of subacetate of lead, of red oxide of mercury, sulphurated potash, iodide of sulphur and veratrina.

PARAFFINUM MOLLE. SOFT PARAFFIN OR VASELINE.

This is a semi-solid mixture containing some of the softer or more fluid members of the paraffin series of hydrocarbons ; it is usually obtained by purifying the less volatile portions of petroleum.

Characters and Tests.—White or yellowish, translucent, soft, greasy ; is free from acidity, alkalinity, or any unpleasant odour or flavour, and burns with a bright flame, leaving no residue. It is not saponified by solutions of alkalies.

Uses.—The soft paraffin is used in preparing the ointments of boric, carbolic, and salicylic acid, and those of eucalyptus, glycerine of subacetate of lead, of red oxide of mercury, of nitrate of mercury (diluted), sulphurated potash, iodide of sulphur, veratrina, and oleate of zinc.

Therapeutics of the Paraffins.—The hard paraffin is not employed for any absolute therapeutical properties, but simply for making a bland, firm, and non-irritating basis for ointments. Its hardness, high melting point, and unchangeableness render it specially advantageous.

The soft paraffin is unaffected by most substances, and has no tendency to become rancid. It is by far the best basis for ointments, since it is quite free from smell, taste, and grittiness, and contains no changeable or irritating constituents.

It is not a good basis when it is desirable to have substances absorbed by the skin. Its melting point is low, and on application to the skin it melts, becoming almost liquid, and soaking into the apparel, after leaving the incorporated in-

gredient nearly dry, and immediately in contact with the skin. Since this result is obviated by the action of hard paraffin, a perfect mixture is obtained by a mixture of the two paraffins. When absorption by the skin is desired, lard or some bland animal oil is preferable. Ointments of the alkaloid should be compounded with lard, and the antiseptic applications, as boric, carbolic, salicylic acid, and creasote, are better made with vaseline. The soft paraffin is an excellent application for burns, scalds, sores, eczema, intertrigo, and all irritable states of the skin.

PETROLEUM SPIRIT. BENZOLINE. PETROLEUM ETHER.

This is a colourless, very volatile, and highly inflammable liquid obtained from petroleum, and consists of a mixture of the lower members of the paraffin or marsh-gas series of hydrocarbons.

Rock oil or petroleum (Petri oleum) is obtained by sinking wells about 60 feet deep, in which the liquid is collected as it oozes from the soil, chiefly of Rangoon, the kingdoms of Burmah, in Pennsylvania and Canada. The liquid is shaken with sulphuric acid ; after the removal of certain organic bodies and rectifications, the residue constitutes rock oil or mineral naphtha. It possesses, at ordinary temperatures, the consistency of goose fat, is lighter than water, has a peculiar odour, and generally presents a greenish-brown colour. It is composed almost entirely of volatile constituents, of which about 11 per cent. are given off below 212° F. (100° C.). About 10 per cent. of the volatile bodies consists of a body fusible at 149° F. (65° C.), but which at ordinary temperatures is solid (paraffin).

POTASSIUM. KALIUM. K=39.

POTASSA CAUSTICA. CAUSTIC POTASH. KHO.

Preparation.—By boiling down the solution of potash rapidly to a syrupy consistence in a clean silver vessel, until a drop removed upon a glass rod solidifies on cooling ; it is then poured into proper moulds, and after it has solidified, and while still warm, is placed in stoppered bottles. Vessels of porcelain, glass, or platinum must not be used in this process, since caustic potash acts injuriously upon these substances.

Characters and Tests.—In hard white pencils or cakes, very deliquescent, powerfully alkaline and corrosive. A watery solution acidulated by nitric acid gives, with perchloride of platinum, a yellow precipitate of potassio-platino-chloride.

Therapeutics.—For touching ulcers and making issues ; it is made into a paste, with spirit, for destroying tumours and cancers.

Adulterations.—The same as of liquor potassæ, but in addition the oxides of iron and aluminium.

It is used in preparing the *potassii permanganas*, and the following :

LIQUOR POTASSÆ. SOLUTION OF POTASH. KHO.

Preparation.—Carbonate of potassium is dissolved in water, and the solution boiled in an iron vessel ; it is then mixed with slaked lime, the insoluble matter allowed to subside, the clear liquid being transferred by a syphon to a stoppered green glass bottle.

Characters and Tests.—A colourless liquid, kept in green glass bottles, since white glass contains lead, which is dissolved by the potash. Contains 5·84 per cent. by weight of hydrate of potassium, KHO.

Dose.—15 to 60 minims.

Therapeutics.—In large doses and undiluted, liquor potassæ is an irritant caustic poison ; given internally, in a diluted form,

it is valuable in certain forms of dyspepsia, acting as a direct antacid, and neutralising any free acid in the stomach. It is useful in skin diseases dependent upon a morbid condition of the stomach, as in erythema ; as a blood alterant in serous inflammations, as pericarditis, pleuritis, and in periostitis ; and in chronic bronchitis, scrofula, syphilis, and chronic rheumatism. It is occasionally applied as a wash in some chronic skin diseases.

Adulterations.—It may contain carbonate and sulphate of potassium, chloride of potassium, and lime.

POTASSA SULPHURATA. SULPHURATED POTASH.

This is a mixture of salts of potassium, the chief of which is sulphide (K_2S_3).

Preparation. — Carbonate of potassium in powder and sublimed sulphur are heated in a Cornish or Hessian crucible until completely fused together. The liquid contents are then poured out and excluded from air as much as possible until solidified. When cold, the solid product is broken into fragments, and enclosed in a green glass bottle furnished with an air-tight stopper.

Characters and Tests.—Solid greenish fragments, liver-brown when recently broken, alkaline, and acrid to the taste, readily forming with water a yellow solution, which has the odour of sulphuretted hydrogen (H_2S), and evolves it freely when excess of hydrochloric acid (HCl) is dropped into it, chloride of potassium (KCl) being formed, and sulphur (S) being at the same time deposited ($K_2S_3 + 2HCl = 2KCl + 2S + H_2S$). The acid fluid when boiled and filtered is precipitated yellow by perchloride of platinum, showing the presence of a potassium salt, and white by chloride of barium, showing the presence of sulphuric acid.

Therapeutics.—A useful remedy, internally and externally, for scabies, and valuable as a bath in chronic eruptions, as psoriasis and eczema.

Official Preparation.—Unguentum Potassæ Sulphuratæ.—Ointment of Sulphurated Potash (sulphurated potash, 30 grains, hard paraffin ¼ ounce, soft paraffin ¾ ounce).

It should be prepared at the time when required, as it quickly changes.

POTASSII ACETAS. ACETATE OF POTASSIUM.

Preparation.—Carbonate of potassium is added gradually to acetic acid and the solution evaporated to dryness.

Characters and Tests.—White foliaceous satiny masses, very deliquescent, with a watery solution of which tartaric acid gives a crystalline precipitate (acid tartrate of potassium). Sulphuric acid causes the disengagement of acetic acid, and a diluted solution of perchloride of iron strikes a deep *cherry-red* colour, peracetate of iron being formed.

Dose.—10 grains to 1 drachm, as a *diuretic*; as a *purgative* 2 drachms and upwards.

Therapeutics.—This salt often appears in the urine in the form of the carbonate; it renders that fluid alkaline, and increases its secretion. Large and concentrated doses produce a slight purgative effect. It is very useful in various forms of dropsy, in acute rheumatism, skin diseases, chronic enlargements of glands and other organs, and has occasionally been used as an anthelmintic.

Adulterations.—Traces of sulphates and chlorides.

POTASSII CARBONAS. CARBONATE OF POTASSIUM.

$K_2CO_3 + 16H_2O$.

Preparation.—It is obtained from commercial pearl ash, the product of the lixiviation of wood ashes, by treating the pearl ash with its own weight of distilled water, and evaporating the solution so formed to dryness, while it is kept briskly agitated.

Characters and Tests.—A white crystalline powder, alkaline and caustic to the taste, very deliquescent, readily soluble in water, effervescing with diluted hydrochloric acid, showing presence of a carbonate.

20 grains of this salt will neutralise 17 grains of citric acid or 18 grains of tartaric acid.

Dose.—10 to 30 grains.

Carbonate of potassium is contained in the *decoctum aloes compositum*, *enema aloes*, *liquor arsenicalis*, and *mistura ferri composita*.

Therapeutics. — Used for the same purposes as liquor potassæ, but it is much less caustic.

Adulterations.—May contain sulphates and chlorides of potassium.

POTASSII BICARBONAS. BICARBONATE OF POTASSIUM. $KHCO_3$.

Preparation.—By passing carbonic acid gas (CO_2) through a strong aqueous solution of carbonate of potassium (K_2CO_3) to saturation and recrystallising the separated salt thus :—

$$K_2CO_3 + H_2O + CO_2 = 2KHCO_3.$$

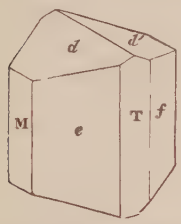


FIG. 33.—Modified prism of bicarbonate of potassium.

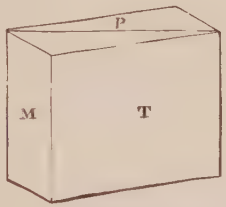


FIG. 34.—Prism derived by cleavage.

Characters and Tests.—Colourless right rhombic prisms (figs. 33, 34), not deliquescent, of a saline feebly alkaline taste, not corrosive. Diluted hydrochloric acid causes strong effervescence of CO_2.

Dose.—10 to 40 grains.

20 grains of this salt neutralise 14 grains of citric acid, or 15 of tartaric acid.

Therapeutics.—A direct antacid, antilithic and diuretic, rendering the urine strongly alkaline, and probably influencing the composition of the blood. It is chiefly used in dyspepsia,

and the uric acid diathesis : it is extremely valuable in acute rheumatism when given in large and frequent doses.

Adulterations.—Carbonate of potassium.

Liquor Potassæ Effervescens.—Effervescing solution of potash is prepared by forcing as much carbonic anhydride into bicarbonate of potassium and water as can be introduced under a pressure of about four atmospheres.

Dose.—5 to 10 ounces.

POTASSII BICHROMAS. BICHROMATE OF POTASSIUM. $K_2Cr_2O_7$.

Preparation.—This salt is formed by roasting chrome-iron ore (FeO, Cr_2O_3) with a mixture of carbonate of potassium (K_2CO_3) and chalk (carbonate of calcium, $CaCO_3$) in a furnace through which a current of air passes.

$2FeO,Cr_2O_3 + 4K_2CO_3 + O_7 = Fe_2O_3 + 4CO_2 + 4K_2CrO_4$.

Ferric oxide, carbonic anhydride, and *yellow* chromate of potassium are formed. The current of air supplies the oxygen (O). The carbonate of calcium is added to diminish the fusibility of the mixture, and so keep it in a porous condition.

To the *yellow* chromate (K_2CrO_4) sulphuric acid (H_2SO_4) is added. $2K_2CrO_4 + H_2SO_4 = H_2O + K_2SO_4 + K_2Cr_2O_7$.

Water, sulphate of potassium, and the *red* bichromate of potassium are then formed.

Characters and Tests.— In large red transparent four-sided tables ; anhydrous ; fuses below redness ; at a higher temperature is decomposed, yielding green oxide of chromium and yellow chromate of potassium, which may be separated by dissolving the latter in water. The bichromate dissolved in water gives a *yellowish-white* precipitate with chloride of barium, and a *purplish-red* precipitate with nitrate of silver, both precipitates being soluble in diluted nitric acid. The solution also when digested with sulphuric acid and rectified spirit acquires an emerald-green colour.

When excess of H_2SO_4 is added to a cold saturated solution of $K_2Cr_2O_7$, water (H_2O) and sulphate of potassium (K_2SO_4)

are formed, and chromic anhydride (CrO_3) is deposited in *crimson* needles.

Thus :—$K_2Cr_2O_7 + H_2SO_4 = H_2O + K_2SO_4 + 2CrO_3$.

This salt is used in the preparation of *chromic acid* and *valerianate of sodium.*

POTASSII CITRAS. CITRATE OF POTASSIUM.

$K_3C_6H_5O_7$.

Preparation.—Citric acid is dissolved in water, and to it is added carbonate of potassium. The mixture is filtered and evaporated to dryness, stirring constantly after a pellicle has begun to form, till the salt granulates.

Characters and Tests.—A white powder of saline feebly acid taste, deliquescent, and very soluble in water. Heated with sulphuric acid it forms a brown fluid, gives off an inflammable gas (carburetted hydrogen, CH_4), and evolves the odour of acetic acid. The solution, mixed with a solution of chloride of calcium, remains clear until it is boiled, when a white precipitate of citrate of calcium separates, readily and almost entirely soluble in acetic acid=indicating the absence of tartrate, with which, in the cold, chloride of calcium gives an immediate precipitate.

Dose.—20 to 60 grains.

Therapeutics.—This salt is readily absorbed, and less likely to purge than the other vegetable salts of potassium. It is useful as a saline febrifuge, increasing the secretion from the kidneys, and appearing in the urine as the carbonate. It may be employed in the uric acid diathesis, and possesses powerful antiscorbutic properties.

POTASSII CHLORAS. CHLORATE OF POTASSIUM.

$KClO_3$.

Preparation.—Slaked lime and carbonate of potassium are mixed together, and the mixture slightly moistened with water. Through this mixture washed chlorine gas (made by the action of hydrochloric acid upon black oxide of manganese) is passed.

The fluid is then filtered and evaporated till a film forms on the surface, and it is then set aside to cool and crystallise.

Characters and Tests.—In colourless rhomboidal crystalline plates (fig. 35), with a cool saline taste, sparingly soluble in cold water. It explodes when triturated with sulphur or sulphides. By heat it fuses, gives off oxygen gas, and leaves a white residue (chloride of potassium).

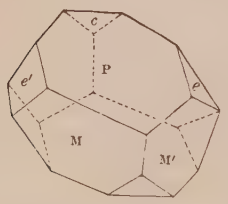


FIG. 35.—Potassium chlorate. Primary form the oblique rhombic prism.

Dose.—10 to 30 grains.

Official Preparation. — POTASSÆ CHLORATIS TROCHISCI. Chlorate of Potassium Lozenges. (Chlorate of potassium, refined sugar, gum acacia, all in powder; mucilage of gum acacia and distilled water.)

Each lozenge contains 5 grains of chlorate of potassium.

Dose.—1 to 6 lozenges.

It is also used in preparing *permanganate of potassium*

Therapeutics.—Refrigerant, stimulant, and diuretic, similar to nitre; almost a specific in severe tonsillitis, aphthæ, and stomatitis, and useful in mercurial ptyalism, salivation in scarlatina and typhus fever.

Adulteration.—Chloride of potassium and lime.

POTASSII NITRAS. NITRATE OF POTASSIUM. KNO_3.

This salt is found native as an efflorescence on the soil of India, and is prepared artificially by "Nitrification" In this process animal matter, containing nitrogen, together with wood-ashes and lime, is exposed in heaps to the action of air. Oxidation of the organic matter takes place gradually, nitric acid is formed, and, uniting with the lime and potash, produces nitrate of calcium (Ca_2NO_3) and nitrate of potassium (KNO_3) After boiling with water, potassium carbonate (K_2CO_3) is added; this decomposes the nitrate of calcium, and the nitrate of potassium crystallises out.

The nitrate of potassium of commerce is purified, if necessary, by crystallisation from solution in distilled water.

Characters and Tests.—In white crystalline masses or fragments of striated six-sided prisms with dihedral summits (figs. 36, 37), rarely in obtuse rhombohedra; colourless, of a peculiar cool saline taste. Thrown upon the fire the salt deflagrates.

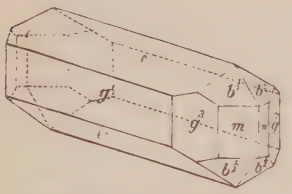


FIG. 36.—Crystal of nitre.

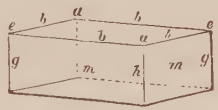


FIG. 37.—Primitive right rhombic prism of nitre.

Dose.—10 to 30 grains.

Therapeutics.—Refrigerant, diaphoretic, and diuretic; in large doses it is powerfully sedative to the heart and vascular system. Is given in febrile affections, and is used as a gargle in inflammatory sore throat. It has been stated to be especially useful in acute rheumatism.

Adulterations.—Traces of sulphates or chlorides.

Nitrate of potassium is also a powerful oxidising agent. When fused and cast into moulds it forms small bullet-shaped masses, and in this condition is known as *Sal Prunella.*

It is used in preparing the *Argenti et Potassii Nitras.*

POTASSII PERMANGANAS. PERMANGANATE OF POTASSIUM. $KMnO_4$.

Preparation.—Chlorate of potassium and oxide of manganese are mixed in fine powder, and caustic potash (previously dissolved in water) is then added. The mixture is now evaporated to dryness, and the residual mass is pulverised and heated with a dull red heat until semifused. It is then boiled with water and decanted from insoluble matters and saturated with carbonic acid, being then evaporated until a pellicle forms. It is then set aside to cool and crystallise. The crystalline mass is drained, boiled in water, and strained through a funnel, the throat of which is lightly obstructed by a little asbestos (a

fibrous silicate), since paper or other organic filtering substance, with the exception of gun-cotton, would decompose the permanganate. The fluid is allowed to cool and crystallise, the crystals are drained and dried by placing them under a bell jar over a vessel containing sulphuric acid.

Characters and Tests. — Dark purple slender prismatic crystals, inodorous, with a sweet astringent taste, soluble in water. A single small crystal suffices to form with an ounce of water a rich purple solution, which, when mixed with a little rectified spirit and heated, becomes yellowish-brown. The permanganic acid is here reduced to the hydrated peroxide of manganese, the alcohol becoming oxidised to acetic acid, and combining with the potash which is set free. The crystals heated to redness decrepitate, evolve oxygen gas, and leave a black residue, from which water extracts potash. Entirely soluble in cold water.

Official Preparation.—LIQUOR POTASSÆ PERMANGANATIS. Solution of permanganate of potassium, strength about 1 in 100; intense purple.

Dose.—Internally 2 to 4 drachms; when used externally, 1 drachm to 5 or 10 ounces of water.

Therapeutics.—A powerful oxidising agent; antiseptic and a deodoriser; it is said to be changed in the stomach into black oxide of manganese, giving off oxygen. It is applied to foul ulcers and gangrenous parts; also used as a gargle, injection, etc., in fœtid discharges, and occasionally in diphtheria. It is also given in diabetes.

POTASSII FERROCYANIDUM. FERROCYANIDE OF POTASSIUM. $K_4FeC_6N_6,3H_2O$.

This salt is also known as yellow prussiate of potassium, and is obtained by fusing animal substances, such as the cuttings of horns, hoofs, and skins, with carbonate of potassium, in an iron pot, lixiviating the crude product with water, and purifying the salt by crystallisation (fig. 38).

Characters and Tests.—In large yellow crystals (figs. 39, 40), permanent in the air, soluble in water, insoluble in alcohol. The

aqueous solution precipitates *deep blue* with persulphate of iron, *chocolate red* with sulphate of copper, and *white* with acetate of lead. Heated with diluted sulphuric acid, hydrocyanic acid

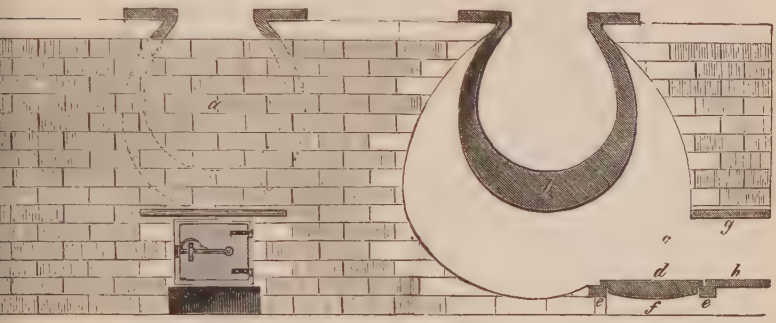


FIG. 38.—Egg-shaped iron pots and furnaces used for the manufacture of ferrocyanide of potassium.

a, Front view of furnace with pot; *b*, section of pot *in situ*; *c*, fire-place; *d*, fire-bar; *e*, *e*, bearing-bars: *f*, ash-pit; *g*, bearing-plate; *h*, dead plate.

vapours are evolved. It is used as a test re-agent for ferric salts, with which it yields a prussian-blue precipitate. With ferrous

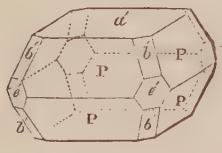


FIG. 39.—Truncated octahedron of ferrocyanide of potassium.

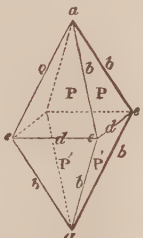


FIG. 40.—Octahedron (primary form) of ferrocyanide of potassium.

salts it gives a white or pale blue precipitate. Does not appear to be poisonous, and is used for the preparation of prussic acid. Is not used medicinally.

POTASSII FERRICYANIDUM. FERRICYANIDE OF POTASSIUM,

Or red prussiate of potassium ($K_3FeC_6N_6$), is merely used as a test for the protosalts of iron, with which it strikes *dark blue*.

It is prepared by passing a stream of chlorine gas through the yellow prussiate of potassium.

POTASSII SULPHAS. SULPHATE OF POTASSIUM. K_2SO_4.

Preparation.—This salt is obtained from the residuum (an impure acid sulphate of potassium) of the distillation of nitric acid, when this acid is made by acting upon nitrate of potassium with sulphuric acid, the excess of acid being got rid of. Slaked

FIG. 41. Neutral sulphate of potassium. Common or pyramidal crystal with short intervening prism.

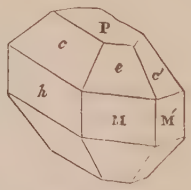


FIG. 42. Ditto modified.

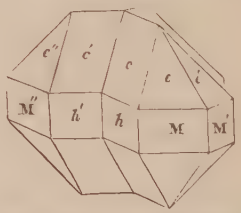


FIG 43. Compound crystal, composed of three, so united that their upper edges meet at angles of 120°.

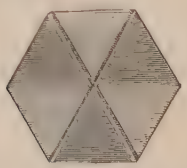


FIG. 44.—Tesselated appearance of a plate of sulphate of potassium as seen by polarised light.

FIG. 45.—Prism of hydrous disulphate of potassium.

lime is added, which is again got rid of by means of carbonate of potassium. Diluted sulphuric acid is then added to the filtered liquid, the sulphate of potassium being subsequently submitted to evaporation and crystallisation.

Characters and Tests.—In colourless hard six-sided prisms terminated by six-sided pyramids (figs. 41, 42, 43, 44, 45); decrepitates strongly when heated; sparingly soluble in water; insoluble in alcohol.

Sulphate of potassium is contained in *Pulvis ipecacuanhæ compositus*, *Pilula colocynthidis composita*, *Pilula colocynthidis et hyoscyami*, and *Pilula ipecacuanhæ cum scillâ*.

Dose.—15 to 60 grains.

Therapeutics. — A mild cathartic, generally given with rhubarb and other vegetable aperients. It is often employed on account of its mechanical properties, since it intimately divides vegetable substances, as in Dover's powder. It is useful in the treatment of dyspepsia and in jaundice.

POTASSII TARTRAS. TARTRATE OF POTASSIUM.

$K_2C_4H_4O_6$.

Preparation —Acid carbonate of potassium is added by degrees to carbonate of potassium dissolved in water until the liquid is neutral to test paper. It is then filtered and concentrated till a pellicle forms on the surface, and is then set aside to cool and crystallise. More crystals may be obtained by evaporating and cooling the mother-liquor.

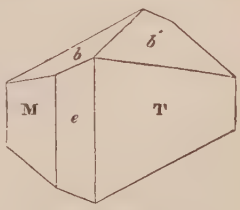


FIG. 46.—Crystal of tartrate of potassium.

Characters and Tests.—In small colourless four or six-sided prisms (fig. 46). Heated with sulphuric acid it forms a black tarry fluid, evolving inflammable gas and the odour of burned sugar. Acetic acid added sparingly to its solution causes the separation of a white crystalline precipitate (acid tartrate). Entirely dissolved by its own weight of water.

Dose.—60 grains to $\frac{1}{2}$ ounce.

Therapeutics.—A mild cooling purgative, producing watery stools generally combined with, and increasing the action of,

such vegetable purgatives as rhubarb, senna, etc. In smaller doses it is alterative and diuretic.

Adulterations.—Sulphates.

POTASSII TARTRAS ACIDA. ACID TARTRATE OF POTASSIUM. $KHC_4H_4O_6$.

An acid salt obtained from the crude tartar which is deposited during the fermentation of grape-juice, and from the lees of wine.

Characters and Tests.—A gritty white powder, or fragments of cakes crystallised on one surface; the crystals are right rhombic prisms (figs. 47, 48) or oblique rhombic prisms; of a

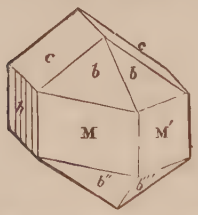


FIG. 47.—Ordinary perfect crystal of acid tartrate of potassium.

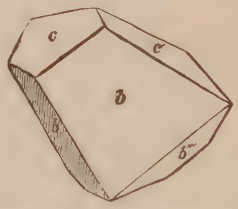


FIG. 48.—Common crystal of acid tartrate of potassium.

pleasant acid taste, sparingly soluble in water, insoluble in spirit. Heated in a crucible it evolves inflammable gas and the odour of burned sugar, and leaves a black residue, called "black flux."

This substance is contained in *Pulvis jalapæ compositus* and *Confectio sulphuris*.

Dose.—(20 to 60 grains).

Therapeutics.—In small doses (20 to 60 grains), refrigerant and diuretic; in large doses (120 to 300 grains), a powerful hydragogue purgative. It is given as an acid drink in febrile affections, and as a purge in dropsical affections; it is best combined with jalap, gamboge, or scammony, and belladonna is said to assist its action.

Adulteration.—Traces of lime.

POTASSII BROMIDUM. BROMIDE OF POTASSIUM. KBr.

Preparation.—Bromine is added to solution of potash, until the mixture has acquired a permanent brown tint. The mixture is evaporated to dryness and the residue mixed with wood charcoal in fine powder. This is thrown in a red-hot iron crucible until it is fused, and then poured out until the fused mass has cooled. It is then dissolved in boiling water, filtered, and set aside to crystallise.

Characters.—In colourless cubical crystals, with no odour, but a pungent saline taste, readily soluble in water, less soluble in spirit. When its solution in water is mixed with a little chlorine, chloroform agitated with it, on falling to the bottom, exhibits a red colour. Here the bromine is set free by the chlorine, and, becoming dissolved in the chloroform, colours it.

Dose.—5 to 30 grains, or more.

Therapeutics.—Used to produce the constitutional effects of bromine. (See page 21.)

Adulterations.—Iodide and bromate of potassium.

POTASSII IODIDUM. IODIDE OF POTASSIUM. KI.

Preparation.—From solution of potash, iodine and wood charcoal in a similar manner to that in which bromide of potassium is made.

Characters and Tests.—In colourless, generally opaque, cubic crystals, readily soluble in water, and in a less degree in spirit. It commonly has a feeble alkaline reaction; its solution, mixed with mucilage of starch, gives a blue colour on the addition of a minute quantity of solution of chlorine. If iodate is present, iodic acid (HIO_3) would be liberated from it by the acid, and hydriodic acid (HI) from the iodide. By the reaction of these acids on each other iodine would be set free which would colour the starch. Thus: $HIO_3 + 5HI = 3H_2O + 6I$. Solution of nitrate of silver added in excess forms a yellowish-white precipitate of iodide of silver.

Dose.—2 to 20 grains.

Official Preparations.—

Potassii Iodidi cum Sapone Linimentum. Liniment of Iodide of Potassium with soap (curd soap, iodide of potassium, glycerine, oil of lemon and distilled water).

Potassii Iodidi Unguentum. Ointment of Iodide of Potassium. Iodide of potassium, carbonate of potassium, distilled water and benzoated lard. =(1 in $8\frac{3}{4}$).

The carbonate of potassium is added to prevent the ointment turning yellow.

Therapeutics.—Iodide of potassium is better adapted for internal administration than iodine itself (see page 24), since it produces no local irritation. It possesses the power of eliminating metallic substances, as mercury and lead, from the system. It is better borne by the system when combined with nux vomica.

Adulterations.—It may be damp, or contain chloride of sodium or potassium, carbonate or iodate of potassium and free iodine.

POTASSII CYANIDUM. CYANIDE OF POTASSIUM. KCN.

The salt may be obtained by heating ferrocyanide of potassium at a red heat until the gas ceases to be evolved, allowing the sediment to subside in the still molten mass and pouring off the clear fluid. It may be purified by solution in, and crystallisation from, spirit.

Characters and Tests.—White opaque deliquescent crystalline masses having the odour of hydrocyanic acid, readily soluble in water, intensely poisonous. It is used in preparing the *Bismuthum Purificatum.*

TESTS FOR THE SALTS OF POTASSIUM.

Potassium salts are known by their yielding a violet colour to flame, and by their solutions giving with perchloride of platinum a yellow granular precipitate falling slowly.

SODIUM. NATRIUM. Na=23.

SODII ETHYLATIS LIQUOR. SOLUTION OF ETHYLATE OF SODIUM.

Preparation.—By dissolving metallic sodium, free from oxide (1), in ethylic alcohol (20), contained in a flask, the latter being kept cool by a stream of cold water.

Characters and Tests.—A syrupy colourless liquid becoming brown by keeping. When heated it boils and yields alcoholic vapours, leaving a white salt, which chars when strongly heated. It contains 19 per cent. of the solid salt Sodii Ethylas, NaC_2H_5O.

Use.—A valuable caustic, almost painless although powerful; also antiseptic. Is employed for the removal of nævi, over which it is brushed; after its use but little deformity is left, and if its application should cause any pain, a drop of chloroform may be placed on the part. Chloroform converts the ethylate into chloride of sodium and ether.

SODA CAUSTICA. CAUSTIC SODA. NaHO.

Preparation.—By boiling down solution of soda rapidly in a silver or clean iron vessel, until a fluid of oily consistence remains, a drop of which, when removed on a warm glass rod, solidifies on cooling. The fluid is then poured on a clean silver or iron plate, or into moulds, and, as soon as it has solidified, it is broken in pieces, and preserved in stoppered green glass bottles.

Characters and Tests.—Hard and greyish-white, very alkaline and corrosive. It imparts a yellow colour to flame. It may contain traces of sulphates and chlorides.

Therapeutics.—Has been used externally as a caustic.

LIQUOR SODÆ. SOLUTION OF SODA. NaHO.

Preparation.—Carbonate of sodium is dissolved in water, boiled, and mixed gradually with slaked lime; it is washed to

get rid of any chloride, the insoluble matter is allowed to subside and the fluid decanted into a green glass bottle.

Characters and Tests.—It is a colourless fluid which may contain traces of sulphates and chlorides.

Therapeutics.—An antacid, used in some diseases of the stomach in preference to potash.

SODA TARTARATA. TARTARATED SODA.

$NaKC_4H_4O_6,4H_2O$.

This is a double tartrate of sodium and potassium, and is sometimes called Rochelle salt.

Preparation.—Carbonate of sodium is dissolved in boiling distilled water, and added gradually to acid tartrate of potassium until a neutral fluid results. This is boiled and filtered. The liquid is concentrated and set aside to crystallise.

Characters and Tests.—In colourless transparent prisms or halves of prisms of the right rhombic order, generally eight-sided (figs. 49, 50); tasting like common salt. Heated with

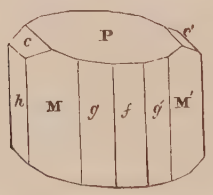


FIG. 49.—Prism of Rochelle salt.

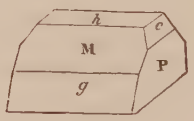


FIG. 50.—Natural half of fig. 49.

sulphuric acid it blackens, evolving inflammable gases and the odour of burnt sugar. It imparts a yellow colour to flame. A strong solution gives a crystalline precipitate (acid tartrate of potassium) with a small quantity of acetic acid. Entirely soluble in cold water.

Dose.—$\frac{1}{4}$ to $\frac{1}{2}$ ounce.

Therapeutics. A mild cooling saline purgative suitable for irritable and delicate stomachs; in smaller doses diuretic, rendering the urine alkaline.

SODÆ TARTARATÆ PULVIS EFFERVESCENS. EFFERVESCENT TARTARATED SODA POWDER.

This is commonly known as Seidlitz powder, and is prepared as follows :

A. Tartarated soda, in dry powder (120 grains), and bicarbonate of sodium, in dry powder (40 grains), are mixed and wrapped in blue paper.

B. Tartaric acid, in dry powder (38 grains), is wrapped in white paper.

Dose.—The A powder, dissolved in nearly half a pint of cold or warm water, and the B powder then added.

Therapeutic.—A mild laxative.

SODII BENZOAS. BENZOATE OF SODIUM.

$NaC_7H_5O_2$.

Preparation.—This salt may be obtained by neutralising benzoic acid with solution of carbonate of sodium and evaporating to dryness.

Characters and Tests.—A white obscurely crystalline or amorphous powder, inodorous, or having a faint benzoic odour, of a sweetish alkaline taste, and a faint alkaline reaction. Very soluble in water. An aqueous solution gives a yellowish or a flesh-coloured precipitate (benzoate of iron) when mixed with solution of persulphate of iron.

Dose.—10 to 30 grains.

Therapeutics.—The benzoates have been given in large doses in phthisis and febrile diseases, in order to act as germicides to the fever poison. Benzoate of sodium has been used as a spray for inhalation in phthisis and in diphtheria. It has proved successful in the treatment of rheumatic polyarthritis when salicylates have failed. It has also been given in scarlet fever and whooping-cough. It has proved valuable in uræmia, lessening the albuminuria, and inhibiting the formation of urea. Its internal administration has also afforded relief in diphtheria and tonsillitis.

SODII BICARBONAS. BICARBONATE OF SODIUM. $NaHCO_3$.

Preparation.—This salt is obtained by saturating carbonate of sodium with carbonic acid, or by the reaction of chloride of sodium and bicarbonate of ammonium.

Characters and Tests.—In powder or small opaque irregular scales, white, of a saline not unpleasant taste. Dissolves with much effervescence in diluted hydrochloric acid, forming a solution in which perchloride of platinum causes no precipitate (thus distinguished from bicarbonate of potassium).

20 grains of bicarbonate of sodium neutralise 16·7 grains of citric acid, or 17·8 grains of tartaric acid.

Dose.—10 to 60 grains.

Official Preparations.—(1) Liquor Sodæ Effervescens Effervescing Solution of Soda, or Soda Water (bicarbonate of sodium dissolved in water, as much pure-washed carbonic anhydride (obtained by the action of sulphuric acid on chalk) being forced in as can be introduced under a pressure of about 4 atmospheres. Each ½-pint bottle contains 15 grains of bicarbonate of sodium.

(2) Trochisci Sodii Bicarbonatis. Lozenges of Bicarbonate of Sodium (bicarbonate of sodium, refined sugar, gum acacia (all in powder), mucilage of gum acacia and distilled water). Each lozenge contains 5 grains of bicarbonate of sodium.

Dose.—1 to 6 lozenges.

Therapeutics.—Very similar to bicarbonate of potassium, but not applicable to the uric acid diathesis. It is said to agree better with the stomach than the potassium salt, and probably influences the secretions of the liver more than potassium bicarbonate. Is used as an antacid in dyspepsia, and moistened with water is a valuable application to the stings of gnats and wasps.

Adulterations.—It may contain carbonate and sulphate of sodium in an efflorescent state.

SODII CITRO-TARTRAS EFFERVESCENS. EFFERVESCENT CITRO-TARTRATE OF SODIUM.

Preparation.—Bicarbonate of sodium, tartaric acid, and citric acid, in powder, are mixed thoroughly and heated to between 200° and 220° Fahr., and when the particles of the powder begin to aggregate, are stirred until they assume a granular form ; the granules of uniform and most convenient size being separated and preserved in well-closed bottles.

Dose.—60 grains to $\frac{1}{4}$ ounce.

Therapeutics.—Acts in a similar manner to tartarated soda, but is more pleasant to the taste. It sits more easily on the stomach on account of the carbonic anhydride which is evolved.

SODII CARBONAS. CARBONATE OF SODIUM.

$Na_2CO_3,10H_2O$.

Preparation.—Is commonly obtained from chloride of sodium either by reaction with bicarbonate of ammonium and subsequent ignition, or by conversion into sulphate and action

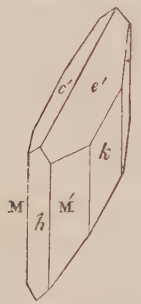


FIG. 51.—Ordinary crystal of carbonate of sodium ; oblique rhombic prisms.

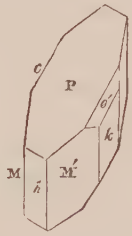


FIG. 52.—Crystal reduced in height.

of heat on a mixture of the sulphate with carbonate of calcium and carbon.

Characters and Tests.—In transparent colourless laminar crystals of a rhombic shape (figs. 51, 52), efflorescent, with a harsh alkaline taste and strong alkaline reaction.

20 grains of carbonate of sodium neutralise 9·8 grains of citric acid, or 10½ grains of tartaric acid.

Dose.—5 to 30 grains.

Adulterations.—Traces of sulphates and chlorides.

It usually contains a little sulphate of sodium.

Therapeutics.—Antacid and antilithic. Chiefly used in diseases accompanied by acidity of the stomach, as dyspepsia and gout. It is employed in the preparation of several salts of sodium.

SODII CARBONAS EXSICCATA. DRIED CARBONATE OF SODIUM. Na_2CO_3.

Preparation.—Carbonate of sodium is exposed in a porcelain capsule to heat gently applied until the crystals crumble to powder. The temperature is then increased and the action continued until vapours cease to be evolved.

Dose.—3 to 10 grains.

Therapeutics.—Analogous to carbonate of potassium, but its action is less caustic.

SODII SULPHIS. SULPHITE OF SODIUM. $Na_2SO_3,7H_2O$.

Preparation.—By the action of sulphurous acid on carbonate of sodium or on caustic soda.

Characters and Tests.—Colourless, transparent monoclinic prisms, efflorescent in dry air, inodorous, with a cooling saline and sulphurous taste. Readily soluble in water ; evolves a sulphurous vapour when treated with hydrochloric acid.

Dose.—5 to 20 grains.

Therapeutics.—Feebly antiseptic ; preventing fermentation similarly to sulphurous acid. May be given in doses of 20 grains in cases of vomiting of torulæ and sarcinæ ventriculi. Has been used externally in the treatment of parasitic diseases of the skin.

SODII HYPOPHOSPHIS. HYPOPHOSPHITE OF SODIUM. $NaPH_2O_2$.

Preparation.—It is obtained by adding carbonate of sodium to solution of hypophosphite of calcium so long as any precipitate of carbonate of calcium is formed, then filtering and evaporating the solution to dryness, stirring constantly when the salt begins to solidify.

Characters and Tests.—A white, granular, deliquescent salt with a bitter nauseous taste. Ignites at a red heat, emitting spontaneously inflammable phosphuretted hydrogen. With nitrate of silver it yields a white precipitate of silver hypophosphite which rapidly darkens.

Dose.—5 to 10 grains.

Therapeutics.—It is sometimes used in phthisis as a nervine tonic.

SODII HYPOSULPHIS. HYPOSULPHITE OF SODIUM $Na_2S_2O_3,5H_2O$.

Preparation.—May be made by gently warming a solution of sulphite of sodium with finely powdered sulphur, or by passing sulphurous acid gas through a solution of sodium sulphide.

Use.—It is only used as a test reagent. 24·8 grains deodorise 1,000 grain measures of the volumetric solution of iodine.

SODII NITRAS. NITRATE OF SODIUM. $NaNO_3$.

A native salt, purified by crystallisation from water.

Characters and Tests.—In colourless, obtuse, rhombohedral crystals, having a cooling saline taste. Thrown on the fire, it deflagrates ; warmed in a test tube with sulphuric acid and copper wire, it evolves ruddy fumes of nitric peroxide. It is soluble in about two parts of cold distilled water.

Use.—This salt is used only for the production of arseniate of sodium ; it is not employed medicinally.

SODII NITRIS. NITRITE OF SODIUM. $NaNO_2$.

Preparation.—By the action of nitrous acid upon carbonate of sodium or caustic soda.

Characters and Tests.—A white or yellowish-white deliquescent crystalline salt, very soluble in water. The solution is neutral or slightly alkaline, and when mixed with diluted sulphuric acid yields a gas which forms ruddy fumes in contact with the air. The aqueous solution, when mixed with solution of sulphate of iron and acetic acid, becomes of a deep-brown colour. The aqueous solution of the salt must not give more than traces of precipitate with solution of chloride of calcium.

Dose.—2 to 5 grains.

Therapeutics.—Nitrite of sodium has proved useful in the treatment of angina pectoris and epileptiform convulsions, exerting an action resembling that of nitrite of amyl; its effects, however, are said to be more lasting. In the treatment of dyspnœa or bronchitis and asthma it is preferred to nitrite of amyl or nitrite of ethyl, since it is more stable. It may be usefully combined with hyoscyamus.

SODII PHOSPHAS. PHOSPHATE OF SODIUM. $Na_2HPO_4,12H_2O$.

Preparation.—May be obtained by adding a solution of carbonate of sodium to a solution of acid phosphate of calcium prepared from a mixture of bone-ash and sulphuric acid.

Characters and Tests.—In transparent, colourless, rhombic prisms, terminated by four converging planes, efflorescent, tasting like common salt. Its solution gives a yellow precipitate with nitrate of silver (=phosphate of silver, Ag_3PO_4). Heated to dull redness, it loses 63 per cent. of its weight, leaving a residue (pyrophosphate), which, when dissolved in water, gives with chloride of barium a precipitate of pyrophosphate of barium almost entirely soluble in diluted nitric acid.

Phosphate of sodium is used in preparing the *Ferri Phosphas* and *Syrupus Ferri Phosphatis*.

Dose.—$\frac{1}{4}$ to 1 ounce.

Therapeutics.—In fairly large doses, a mild saline purgative; in smaller ones, a diuretic, rendering the urine alkaline. As a mild purge, it is well suited for persons of delicate stomach and for children.

Adulterations.—Phosphate of calcium which renders the solution milky.

SODII PHOSPHAS EFFERVESCENS. EFFERVESCENT PHOSPHATE OF SODIUM.

Preparation.—Phosphate of sodium, bicarbonate of sodium, tartaric acid, and citric acid, in powder, are mixed and heated to between 200° and 220° Fahr. (93·3° and 104·4° C.), and when the particles of the powder begin to aggregate, are stirred assiduously until they assume a granular form ; the granules of uniform and most convenient size being separated, and preserved in well-closed bottles. After granulating, the salt should be absolutely dry before being bottled, for if not so, it will rapidly deteriorate.

Dose.—$\frac{1}{4}$ to $\frac{1}{2}$ ounce.

SODII SULPHAS. SULPHATE OF SODIUM. GLAUBER'S SALT. $Na_2SO_4,10H_2O$.

Preparation.—May be obtained from the residue left in the manufacture of hydrochloric acid from chloride of sodium by neutralising it with carbonate of sodium, and crystallising from solution in water.

Characters and Tests.—In transparent oblique prisms (fig. 53) ; has a salt and bitter taste ; effloresces on exposure to the air ; soluble in water, insoluble in spirit.

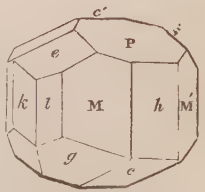


Fig. 53 — Prism of sulphate of sodium.

Dose.—$\frac{1}{4}$ to 1 ounce.

Therapeutics.—A cooling saline purgative

SODII SULPHAS EFFERVESCENS. EFFERVESCENT SULPHATE OF SODIUM.

Preparation.—Sulphate of sodium in crystals, bicarbonate of sodium, tartaric acid, and citric acid, in powder, are mixed and heated to between 200° and 220° Fahr. (93·3° and 104·4° C.), and when the particles of the powder begin to aggregate, are stirred assiduously until they assume a granular form ; the granules of uniform and most convenient size being separated and preserved in well-closed bottles.

Dose.—$\frac{1}{4}$ to $\frac{1}{2}$ ounce.

SODII BROMIDUM. BROMIDE OF SODIUM. NaBr.

Preparation.—May be obtained in the same manner as the bromide of potassium, solution of soda being employed in place of solution of potash, and crystallisation being conducted from warm solutions.

Characters and Tests. A granular white powder consisting of small monoclinic crystals, somewhat deliquescent, inodorous, with a saline taste, soluble in water. The aqueous solution mixed with a little chlorine water, and shaken with chloroform, on precipitation of the latter, exhibits a red colour.

Dose.—10 to 30 grains.

Therapeutics.—A sedative to the nervous system.

Therapeutics.—It resembles bromide of potassium, but is less powerful and depressant. It is a useful adjunct to chloral, opium, hyoscyamus, and belladonna, increasing their effect in anæmic conditions ; combined with bromide of potassium it is valuable in the treatment of epilepsy, pertussis, asthma, laryngismus stridulus, delirium tremens, and acute mania.

SODII CHLORIDUM. CHLORIDE OF SODIUM. COMMON SALT. NaCl.

Occurs native as rock salt, in brine springs and in sea-water.

Characters and Tests. In small white crystalline grains, or transparent cubic crystals (fig. 54), free from moisture ; has a

purely saline taste, imparts a yellow colour to flame, and is soluble in water. The solution gives with nitrate of silver a white precipitate of silver chloride soluble in ammonia, but insoluble in nitric acid.

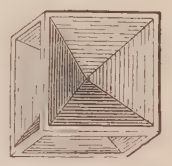


Fig. 54.—Cavernous cube of common salt.

It is used in preparing *Acidum hydrochloricum*, *Hydrargyri perchloridum*, and *Hydrargyri subchloridum*.

Dose.—A tablespoonful or more as an emetic.

Therapeutics.—A necessary article of food. Its deficiency may cause disease, the production of worms, &c. In large doses it is an emetic and purgative, but in smaller doses a slight stimulant and alterative. Externally, its action is stimulant and rubefacient. Sponging or bathing with salt water has proved useful in chronic rheumatism, joint affections, &c. Sea-water is given as an emetic, purgative, and anthelmintic.

SODII IODIDUM. IODIDE OF SODIUM. NaI.

Preparation.—May be obtained by the same process as iodide of potassium, solution of soda being employed in place of solution of potash.

Characters and Tests.—A dry white crystalline deliquescent powder having a saline and somewhat bitter taste. Readily soluble in water. Solution of nitrate of silver in excess gives a yellowish-white precipitate of iodide of silver.

Dose.—3 to 10 grains.

Therapeutics.—It is given in the same doses and for similar purposes as the iodide of potassium.

SODÆ CHLORINATÆ LIQUOR. SOLUTION OF CHLORINATED SODA.

Preparation.—By mixing solutions of carbonate of sodium and chlorinated lime, and filtering the solution which is colourless and alkaline; should be kept in a stoppered bottle in a dark and cool place.

Dose.—10 to 20 minims in 1 ounce of water; as a gargle, ½ ounce to 1 ounce in a pint of water.

Therapeutics.—Antiseptic, stimulant, and resolvent; employed, much diluted, in fevers of a low malignant type, as typhus and scarlatina. Externally, it is applied to unhealthy gangrenous parts, and affections attended by fœtor generally. It is employed as a gargle for ulcerated sore throat, and in ulcerated mouths due to the abuse of mercury.

Official Preparations.—CATAPLASMA SODÆ CHLORINATÆ.—Chlorine poultice. Linseed meal is mixed gradually with water, solution of chlorinated soda being then added with constant stirring.

SODII SALICYLAS. SALICYLATE OF SODIUM

$(NaC_7H_5O_3)_2H_2O$.

Preparation.—May be obtained by the action of salicylic acid on carbonate of sodium, or on caustic soda.

Characters and Tests.—Small colourless or nearly colourless crystalline masses, inodorous, and having a sweetish saline taste, readily soluble in water. When ignited the salt evolves inflammable vapours. A diluted solution is coloured violet, and a concentrated solution reddish-brown, by the addition of perchloride of iron. May contain traces of sulphates and chlorides.

Dose.—10 to 30 grains.

Therapeutics.—The administration of this salt is the most convenient method of exhibiting salicylic acid, than which it is less irritating, and being soluble is more rapidly absorbed. It is employed in the treatment of acute rheumatism, and for reducing temperature in febrile maladies generally. It has been recommended in small doses for the relief of headache, and in larger doses for "white leg." It is also cholagogue, and may be used in the treatment of gall-stones.

SODII SULPHOCARBOLAS. SULPHOCARBOLATE OF SODIUM. $NaC_6H_5SO_42H_2O$.

Preparation.—May be obtained by dissolving carbolic acid in excess of sulphuric acid, supersaturating the liquid with carbonate of barium, filtering, and treating the filtrate with

carbonate of sodium until no further precipitate falls. On evaporation of the filtrate, crystals of sulphocarbolate of sodium are yielded.

Characters and Tests.—Colourless, transparent rhombic prisms, inodorous or nearly so, with a cooling saline and somewhat bitter taste, readily soluble in water. On ignition gives vapours of carbolic acid, and leaves a residue, the solution of which in water yields an insoluble white precipitate with chloride of barium (sulphate of barium).

Dose.—10 to 15 grains.

Therapeutics.—Antipyretic, and possessed of the antiseptic properties of carbolic acid. Has been given in scarlatina, cholera, and diphtheria; also in fermentative conditions of the stomach, and those accompanied by fœtid eructations, and in septic states generally.

SODII VALERIANAS. VALERIANATE OF SODIUM.

$NaC_5H_9O_2$.

Preparation.—Diluted sulphuric acid and solution of bichromate of potassium are mixed with amylic alcohol (fousel oil), valerianic acid being produced. The mixture is then distilled, and the distilled liquid saturated with solution of soda; any floating oil is removed, and the fluid is evaporated to dryness, the products being broken in pieces and placed in a stoppered bottle.

Characters.—In dry white masses without alkaline reaction, entirely soluble in rectified spirit, and giving out a powerful odour of valerian on the addition of diluted sulphuric acid.

Dose.—1 to 5 grains.

It is used in the preparation of *Zinci Valerianas.*

Sodii Arsenias. Arseniate of sodium, $NaHAsO_4,12H_2O$, and $NaHAsO_4,7H_2O$. (See page 131.)

TESTS FOR THE SALTS OF SODIUM.

Sodium salts are known by giving a yellow colour to flame, and by their solutions being precipitated by antimoniate of potassium, provided that the solution has been previously freed from all bases except the alkalies.

LITHIUM. L=7.

LITHII CARBONAS. CARBONATE OF LITHIUM.

L_2CO_3.

Preparation.—May be made by acting with chloride or sulphate of lithium upon carbonate of ammonium.

Characters and Tests.—In white powder or in minute crystalline grains, alkaline in reaction, soluble in 150 parts of cold water, insoluble in alcohol. The solution evaporated to dryness leaves a residue of chloride of lithium, which communicates a red colour to the flame of a spirit lamp, and redissolved in water yields, with phosphate of sodium, a white precipitate of phosphate of lithium. It is thus distinguished from other alkalies. It should be free from lime and magnesia.

Dose.—3 to 6 grains.

Therapeutics.—A very valuable remedy in the uric acid diathesis, since a very small amount of lithia will form a soluble salt with uric acid, and thus be eliminated by the urine. It is more powerful than the corresponding potassium salt, and is employed with success in gout and calculous affections.

Carbonate of lithium is used in the preparation of citrate of lithium and in the following :—

Liquor Lithiæ Effervescens. Effervescing Solution of Lithia (carbonate of lithium, 10 grains to 1 pint of water, as much carbonic acid gas being forced in as can be introduced with a pressure of about four atmospheres). A colourless fluid.

Dose.—5 to 10 ounces.

LITHII CITRAS. CITRATE OF LITHIUM.

$L_3C_6H_5O_7,4H_2O$.

Preparation.—By dissolving carbonate of lithium in water with citric acid, and concentrating for crystals to form.

Characters and Tests.—A white crystalline salt, giving a crimson colour to flame, soluble in water without leaving any residue. Heated to redness it blackens, evolving inflammable gases (showing presence of an organic acid).

Dose.—5 to 10 grains.

Therapeutics. It resembles the carbonate in its remote antacid properties, but it has no direct influence in neutralising acid.

BARIUM. Ba = 137.

BARII CHLORIDUM. CHLORIDE OF BARIUM.

$BaCl_2,2H_2O$.

This salt is prepared by acting upon the carbonate of barium with hydrochloric acid. It is only used in solution as a test for sulphuric acid, with which it gives a white precipitate insoluble in all alkalies and acids, except boiling sulphuric acid, and from this acid precipitated on cooling.

BARIUM SALTS tinge flame green, and their solutions yield a white insoluble precipitate with hydrofluosilicic acid.

CALCIUM. Ca=40.

CALCII CHLORIDUM. CHLORIDE OF CALCIUM.

$CaCl_2,2H_2O$.

Preparation.—It may be formed by neutralising hydrochloric acid with carbonate of calcium, adding a little solution of chlorinated lime and slaked lime to the solution, filtering, evaporating until it becomes solid, and finally drying the salt at about 400° F. (204°·4C.)

Characters and Tests.—In white agglutinated masses, dry but very deliquescent ; evolves no chlorine or hypochlorous acid on the addition of hydrochloric acid (thus distinguished from calx chlorinata) ; solubility 1 in 1 of water, 1 in 3 of rectified spirit. Should not contain traces of carbonic acid, alumina, and iron, &c.

Dose.—3 to 10 grains.

Therapeutics.—Chloride of calcium has been introduced into chemistry and pharmacy on account of its great power of absorbing water. It is used in the preparation of chloroform

and ether, and in the rectification of spirit. Medicinally it acts upon the glandular system, and was at one time used in scrofula. It is also stated to relieve certain forms of vomiting.

Official Preparation.—Liquor Calcii Chloridi. Solution of chloride of calcium. (Choride of calcium, 1 ; distilled water, 5.)

Dose.—15 to 50 minims.

CALCII CARBONAS PRÆCIPITATA. PRECIPITATED CARBONATE OF CALCIUM. $CaCO_3$.

Preparation.—Chloride of calcium and carbonate of sodium are each dissolved and mixed together in water. The precipitate (carbonate of calcium) is allowed to subside ; it is then thoroughly washed to get rid of any chloride, and then dried at 212° F.

Characters and Tests. A white crystalline powder, insoluble in water. The solution, when neutralised by ammonia, lets fall a copious white precipitate on the addition of oxalate of ammonium ; should not contain phosphates or chlorides.

Dose.—10 to 60 grains.

This carbonate is contained in the *Trochisci Bismuthi.* 4 grains in each lozenge, nearly.

Therapeutics. — It is antacid and astringent, but is not often used medicinally.

CALCII HYDRAS. HYDRATE OF CALCIUM. SLAKED LIME. CaH_2O_2. With some impurities.

Preparation.– Distilled water is poured upon lime (oxide of calcium) in a metal pot, and when vapour ceases to be disengaged it is set aside to cool. When the temperature has fallen to that of the atmosphere, the slaked lime is placed on an iron-wire sieve, and by gentle agitation the fine powder is caused to pass through the sieve, rejecting what is left. The powder is placed in a well-stoppered bottle, and kept excluded as much as possible from the air. Slaked lime should be recently prepared.

It is a white powder strongly alkaline and caustic.

Official Preparations.

(1) Liquor Calcis.—Solution of Lime or Lime water. Colourless. Slaked lime and distilled water; about $\frac{1}{2}$ grain of lime to the ounce.

Dose.—1 to 4 fluid ounces.

From solution of lime is made the

(2) Linimentum Calcis.—Liniment of Lime. Solution of lime and olive oil, equal parts of each. A thickish cream.

(3) Liquor Calcis Saccharatus.—Saccharated solution of lime. Slaked lime, refined sugar, in powder; distilled water. 1 ounce = about 16 ounces of lime water.

Dose.—15 to 60 minims.

Therapeutics.—Slaked lime is only used internally, as liquor calcis; it acts as a direct antacid upon the intestinal canal, and, after absorption, upon the blood and secretions. It is astringent, diminishing secretion; and it is serviceable in dyspepsia and diarrhœa associated with acidity. It has also proved valuable in rickets. Linimentum calcis is the best application for burns and scalds.

CALCII PHOSPHAS. PHOSPHATE OF CALCIUM.

$Ca_3P_2O_8$.

Preparation.—Bone ash is digested with diluted hydrochloric acid until it is dissolved. It is then boiled and filtered, and solution of ammonia is added until the reaction of the mixture is alkaline. The precipitate is collected and washed until free from chloride, and subsequently dried at a temperature not exceeding 212° F.

Characters and Tests.—A light white amorphous powder, insoluble in water; the solution continues clear when a diluted solution of acetate of sodium is added to it, but lets fall a white precipitate on the subsequent addition either of a little oxalate of ammonium, showing the presence of lime; or of perchloride of iron, showing the presence of phosphoric acid.

May contain traces of chlorides and of alumina.

Dose.—10 to 20 grains.

Therapeutics.—Phosphate of calcium is contained in Pulvis Antimonialis (2 parts in 3), but is rarely used in medicine at

the present day. It has been employed with advantage for promoting the formation of bone in scrofula, mollities ossium, and rickets. It is also said to promote union in bone fractures.

CALCII SULPHAS. SULPHATE OF CALCIUM.

Native Sulphate of Calcium ($CaSO_4 2H_2O$), rendered nearly anhydrous by heat. It is only used for making the following :—

CALX SULPHURATA. SULPHURATED LIME.

A mixture containing not less than 50 per cent. of sulphide of calcium (CaS).

Preparation.—By mixing thoroughly sulphate of calcium and wood charcoal, both in fine powder, and heating the mixture to redness until the black colour has disappeared ; then cooling and placing the whitish residue in a stoppered bottle.

Characters and Tests.—A nearly white powder with a smell somewhat like that of sulphuretted hydrogen.

May contain a trace of copper salt.

Dose.—$\frac{1}{10}$ to 1 grain given in pill, coated.

Therapeutics. Supposed to exert an anti-suppurative action. Has proved useful in the treatment of boils, abscesses, and carbuncles, and in scrofulous sores, especially those affecting the cervical glands. In large doses this salt acts as an instant poison, and even small doses will sometimes induce much nausea.

CALCII HYPOPHOSPHIS. HYPOPHOSPHITE OF CALCIUM. $Ca_2PH_2O_2$.

Preparation.—Obtained by heating phosphorus with hydrate of calcium and water until phosphuretted hydrogen gas ceases to be evolved ; the liquid is then filtered, and uncombined lime is separated by carbonic acid gas, and the remaining solution evaporated until the salt crystallises.

Characters and Tests.—A white crystalline salt, with a pearly lustre and a nauseous bitter taste. Solubility : 1 in 6

of cold water, only slightly more soluble in hot water. Insoluble in spirit. Heated to redness the crystals ignite, evolving spontaneously inflammable phosphuretted hydrogen, and leaving a reddish coloured residue amounting to about 80 per cent. of the salt.

Dose.—5 to 10 grains.

Therapeutics.—This salt, like the hypophosphite of sodium (in the preparation of which it is employed), is given in cases of general and nervous debility, and in pulmonary phthisis.

CALX. OXIDE OF CALCIUM. LIME. CaO.

An alkaline earth, with some impurities, obtained by calcining chalk or limestone so as to expel carbonic acid gas.

Characters and Tests.- In compact masses of a whitish colour, which readily absorb water, and which, when rather less than their weight of water is added, crack and fall into powder with the development of much heat, forming slaked lime. It may contain carbonic acid, traces of alumina, magnesia, and phosphates.

Lime is used in preparing Calcii Hydras.

CALX CHLORINATA. CHLORINATED LIME.

This is a product obtained by exposing slaked lime to the action of chlorine gas as long as the latter is absorbed. It may be regarded as consisting in the main of a compound of chloride of calcium and hypochlorite of calcium ($CaCl_2$, $CaCl_2O_2$), or as a direct compound of lime and chlorine ($CaOCl_2$). It possesses bleaching and disinfecting properties.

Characters and Tests.—A dull white powder with a feeble odour of chlorine, partially soluble in water. The solution evolves chlorine copiously upon the addition of oxalic acid, and deposits at the same time oxalate of calcium.

Use.—Chlorinated lime possesses disinfectant and bleaching properties. It is used with water as a disinfectant, since it evolves chlorine ; chlorinated soda, however, is to be preferred. When chlorinated lime is used, as soon as the chlorine has escaped, the lime is left in a caustic state, and exercises a

corrosive action. It is used externally, in the form of the liquor, as a lotion to foul ulcers, burns, and cutaneous eruptions, especially the itch.

Chlorinated lime is used in preparing *chloroform*, *vapor chlori*, and the following :—

Liquor Calcis Chlorinatæ. —Solution of Chlorinated Lime. Chlorinated lime and water shaken well and strained. = (1 in 10). Colourless.

CRETA. CHALK. $CaCO_3$.

Native friable carbonate of calcium.

Preparation.—Creta Præparata.

Chalk is used also in producing carbonic acid gas.

CRETA PRÆPARATA. PREPARED CHALK.

Chalk, freed from most of its impurities by elutriation, and afterwards dried in small masses, which are usually of a conical form.

Characters and Tests.—A white amorphous powder, effervescing with acids, and dissolving, with only a slight residue (silica), in diluted hydrochloric acid. Insoluble in water. It may contain traces of alumina, magnesia, or of phosphates.

Dose.—10 to 60 grains.

Official Preparations. — (1) Hydrargyrum cum Creta. Mercury with chalk. Mercury, by weight, 1, prepared chalk, 2, rubbed together in a porcelain mortar until metallic globules are no longer visible to the naked eye, and the whole assumes a grey colour. A light grey powder.

Dose.—3 to 8 grains.

(2) Mistura Cretæ. Chalk Mixture. Prepared chalk, gum acacia in powder, and cinnamon water triturated together, syrup being then added, and the whole mixed. = (1 in 34).

Dose.—1 to 2 fluid ounces.

(2) Pulvis Cretæ Aromaticus.—Aromatic Powder of Chalk. Cinnamon-bark, nutmeg, saffron, cloves, cardamom seeds, refined sugar, and prepared chalk ; all in powder,

mixed thoroughly ; dark fawn colour ; = (about 1 chalk in $4\frac{1}{5}$).

Dose.—10 to 60 grains.

(4) Pulvis Cretæ Aromaticus cum Opio. — Aromatic Powder of Chalk with Opium. Aromatic powder of chalk (with the addition of opium in powder): 1 grain of opium in 40 grains of the entire powder. Dark fawn colour.

Dose.—10 to 40 grains.

Therapeutics. Prepared chalk is astringent and antacid. It is given in diarrhœa, either alone or combined ; it should not, however, be continued for any length of time, as it may lead to the formation of inconvenient concretions. It has been recommended in scrofulous affections and in rickets.

TESTS FOR THE SALTS OF CALCIUM.

Calcium salts are known by their giving an *orange* tint in a Bunsen burner flame, and by their solutions yielding a white precipitate with oxalate of ammonium.

MAGNESIUM. Mg = 24.

MAGNESIA PONDEROSA. HEAVY MAGNESIA. MgO.

Preparation.—Heavy carbonate of magnesium is placed in a Cornish or Hessian crucible, closed loosely by a lid, and exposed to a low red heat until a small quantity taken from the centre of the crucible, cooled, and dropped into warm diluted sulphuric acid, causes no effervescence, showing freedom from carbonic acid. This process, which is termed *calcining* (hence the name calcined magnesia), is usually conducted in large porous covered crucibles placed in a furnace devoted expressly to this operation and heated with coke (fig 55).

Characters and Tests.—A white powder, insoluble in water, but readily dissolved by acids without effervescence (fig. 56). Its solution in hydrochloric acid, when neutralised by a mixed solution of ammonia and chloride of ammonium, gives, with

phosphate of sodium, a copious crystalline precipitate of ammonio-magnesian phosphate. Should contain no lime or sulphuric acid.

Solubility 1 in 5412 of cold water, 1 in 36000 of hot water. Like lime, it is more soluble in cold than in hot water.

Dose.—10 to 60 grains.

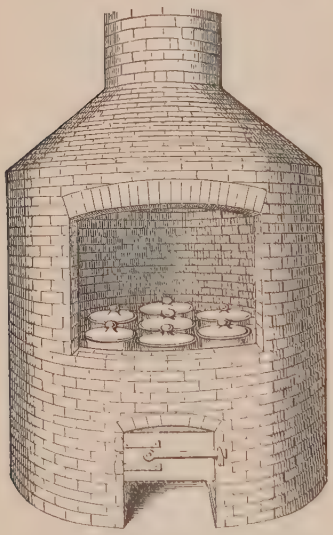


FIG. 55.—Furnace for the preparation of calcined magnesia.

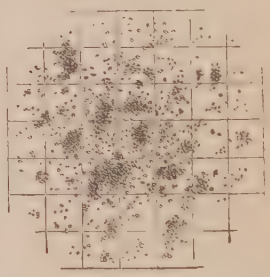


FIG. 56.—Microscopic appearance of heavy magnesia, consisting entirely of yellow minute granules cohering more or less into masses. No fragments of crystals perceptible.

MAGNESIA LEVIS. LIGHT MAGNESIA. MgO.

Preparation.—From the light carbonate of magnesium in the same manner as the heavy magnesia.

It is contained in Pulvis Rhei Compositus, together with powdered rhubarb and ginger.

Characters.—A bulky white powder (fig. 57), differing from the heavy variety only in its greater lightness, the volumes corresponding to the same weight being to each other in the ratio of three and a half to one.

Dose.—10 to 60 grains.

Therapeutics.—A direct antacid, alterative, and laxative. The salts of magnesium after absorption into the blood render

the urine alkaline, uric acid and the urates being held in solution. Given in dyspepsia, heartburn, and conditions accompanied by acidity and constipation. Very useful, combined with rhubarb, in the early stages of diarrhœa. Suitable for children, and for the treatment of gouty affections. It is said by some authors to be a lithontriptic, dissolving concretions, or calculi, composed of uric acid.

The heavy powder is often preferred for its smoothness, but the action of the light powder is found to be quicker.

Adulterations.—May contain a little sulphate or carbonate of magnesium, or lime.

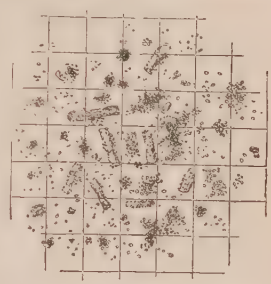


FIG. 57.—Microscopic appearance of light magnesia, showing minutely granular substance intermixed with fragments of prismatic crystals, which are probably carbonate of magnesium which has escaped decomposition during the process of calcination.

MAGNESII CARBONAS PONDEROSA. HEAVY CARBONATE OF MAGNESIUM.

$(MgCO_3)_3.Mg(HO)_2.4H_2O.$

Preparation.—It is precipitated by a solution of carbonate of sodium from a boiling concentrated solution of sulphate of magnesium. The whole is evaporated to dryness, and the

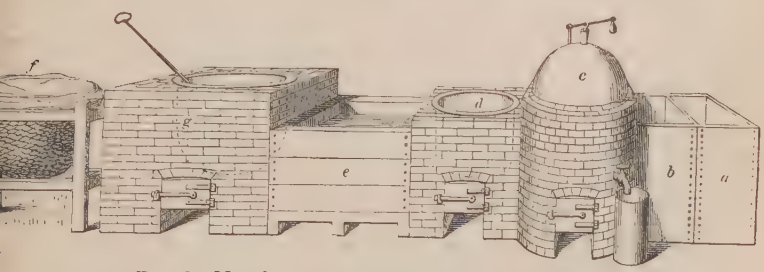


FIG. 58.—Manufactory of heavy carbonate of magnesium.

a, cistern containing the solution of sulphate of magnesium; *b*, cistern containing solution of carbonate of sodium; *c*, boiler for supplying hot water; *d*, boiler for the mixed solutions; *e*, a back in which the carbonate of magnesium is deposited; *f*, filter (linen cloth supported in a basket contained in a wooden stand); *g*, iron pot for drying the carbonate of magnesium.

residue washed entirely free from sulphate of sodium, then dried at 214° F. (100° C.) (fig. 58). May contain traces of sulphuric acid and lime.

Dose.—10 to 60 grains.

Character.—This carbonate is a heavy granular substance, containing no traces of the prismatic crystals observed in the light carbonate. Microscopically it is seen to consist of granules of various sizes, the larger ones highly refracting, globular, and composed of concentrated layers of radiated structure (fig. 59). Examined by the polarising microscope they are found

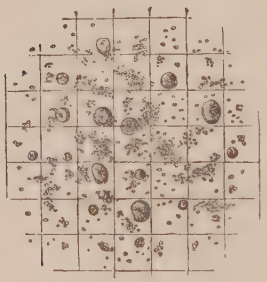


FIG. 59.—Microscopic appearance of heavy carbonate of magnesium.

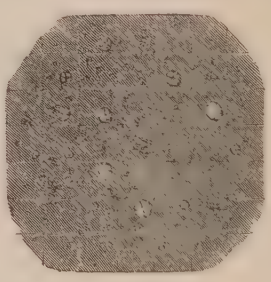


FIG. 60.—Heavy carbonate of magnesium. Microscope polarised.

to possess a double refracting structure and show the black cross (fig. 60).

Official Preparation.—LIQUOR MAGNESII CARBONATIS. Solution of Carbonate of Magnesium. Prepared by impregnating water with carbonic acid gas (under pressure) in which is suspended carbonate of magnesium freshly precipitated by the action of carbonate of sodium upon sulphate of magnesium. Each fluid ounce contains 10 grains of magnesium carbonate.

It is clear and free from any bitter taste.

Dose.—1 to 2 fluid ounces.

Therapeutics.—Carbonate of magnesium is both purgative and antacid ; when it meets with any acidity in the stomach it gives off carbonic acid gas.

It is also used in preparing the *Trochisci Bismuthi* (2½ grains in each trochiscus (lozenge) nearly).

MAGNESII CARBONAS LEVIS. LIGHT CARBONATE OF MAGNESIUM. $(MgCO_3)_3.Mg(HO)_2,4H_2O$.

Preparation. It is precipitated cold by carbonate of sodium from a diluted solution of sulphate of magnesium, and washed until free from sulphate of sodium. Finally dried at 212° F. (100° C.).

Characters.—A very light powder, which, when examined under the microscope, is found to be partly amorphous with numerous slender prisms intermixed (fig. 61). The crystals resemble in shape those of the neutral carbonate of magnesium

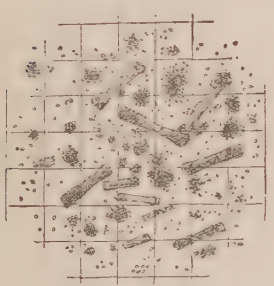


FIG. 61.—Microscopic appearance of light carbonate of magnesium.

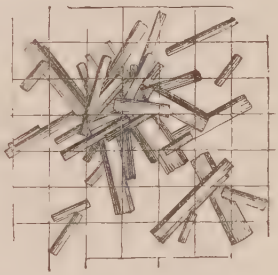


FIG. 62.—Hydrated neutral carbonate of magnesium deposited from Dinneford's solution.

deposited from Dinneford's carbonated magnesia water (fig. 62). The slowness of the precipitation causes the partially crystalline form. Solubility: 1 in 2493 of cold water, 1 in 9000 of hot water. In other respects it resembles the heavy carbonate.

Light carbonate of magnesium is used in the preparation of the *Vapor Olei Pini Sylvestris.*

Dose.—10 to 60 grains.

The difference in the aggregation of the light and heavy carbonates of magnesium is dependent upon the heat employed in their preparation, and upon the amount of dilution of the solutions; in the preparation of the ponderosa more heat and a less degree of dilution are employed.

MAGNESII SULPHAS. SULPHATE OF MAGNESIUM OR EPSOM SALT. $MgSO_4,7H_2O$

Preparation.—It is obtained from dolomite (a double carbonate of calcium and magnesium) by the action of sulphuric acid; insoluble sulphate of calcium and soluble sulphate of magnesium are formed.

Characters and Tests.—In minute colourless and transparent four-sided rhombic prisms with reversed dihedral summits, or four-sided pyramids (figs. 63, 64), possessing a bitter taste.

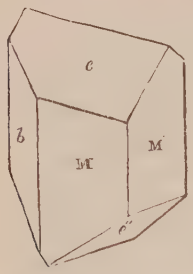


FIG. 63.—Sulphate of magnesium. Common crystal.

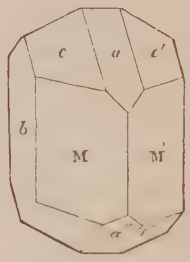


FIG. 64.—Sulphate of magnesium crystal with dihedral reversed summits.

Solubility: 10 in 13 of water measures 18; 20 in 3 of boiling water. It may contain traces of lime and iron. It is contained in the *Mistura Sennæ Composita* (black draught).

Dose.—60 grains to $\frac{1}{2}$ ounce.

Official Preparation.—ENEMA MAGNESII SULPHATIS. Enema of Sulphate of Magnesium (sulphate of magnesium; olive-oil, and mucilage of starch).

Therapeutics.—A mild saline purgative, inducing free watery discharge, and causing little pain or nausea. It is employed in febrile affections, and in congestion of the portal system, colic and obstinate constipation. It is better given in combination, since when administered alone it occasionally produces uncomfortable distension of the abdomen.

MAGNESII SULPHAS EFFERVESCENS. EFFERVESCENT SULPHATE OF MAGNESIUM; ALSO CALLED EFFERVESCENT EPSOM SALT.

Preparation.—Sulphate of magnesium is powdered and mixed with refined sugar, and then with bicarbonate of sodium, tartaric acid, and citric acid, all in powder. The mixture is heated to between 200° and 220° Fahr. (93·3° and 104·4° C.), and when the particles of the powder begin to aggregate they are stirred assiduously until they assume a granular form; then, by means of suitable sieves, the granules of uniform and most convenient size are separated; the preparation is preserved in well-closed bottles.

Dose.—$\frac{1}{4}$ to 1 ounce.

Therapeutics.—A granular salt which dissolves well, and, containing, as it does, 50 per cent. of Epsom salt, acts as a fairly energetic aperient.

MAGNESII CITRATIS LIQUOR. ($Mg_3{}_2C_6H_5O_7$.) SOLUTION OF CITRATE OF MAGNESIUM.

Prepared from the heavy carbonate of magnesium, citric acid, syrup of lemons, bicarbonate of potassium, in crystals, and water.

Dose.—5 to 10 fluid ounces as a mild saline cathartic.

TESTS FOR THE SALTS OF MAGNESIUM.

Magnesium salts are known by their solutions giving a white precipitate with a tribasic phosphate and ammonia.

ALUMINIUM. Al=27.

ALUMEN. ALUM. $Al_2 3SO_4, K_2SO_4, 24H_2O$ or $Al_2 3SO_4, (NH_4)_2SO_4, 24H_2O$.

Sulphate of aluminium and potassium (Potassium Alum) or of aluminium and ammonium (Ammonium Alum) crystallised from solution in water.

Preparation.—Alum is obtained by roasting alum schist. The sulphide of aluminium which is generally present in the schist is oxidised to sulphate of aluminium. This is dissolved in water; sulphate of ammonium or sulphate of potassium is added, and the respective alum subsequently crystallised out.

Characters and Tests.—In colourless transparent crystalline masses, exhibiting the faces of the regular octahedron (fig. 65), and having an acid sweetish astringent taste. Its aqueous solution gives with caustic potash or soda a white precipitate (hydrate of aluminium), soluble in an excess of the reagent. The ammonium alum evolves ammonia when heated with soda or potash. The potassium salt gives a scanty yellow precipitate with perchloride of platinum. The aqueous solution gives an immediate precipitate with chloride of barium, showing the presence of sulphuric acid. May contain traces of iron. It is used in preparing the *Glycerinum Aluminis*, 1 part in $7\frac{1}{4}$.

Fig. 65. Octahedron of alum.

Solubility: 1 in 11 of water, 3 in 1 of boiling water;

Ammonium alum 1 in $1\frac{1}{4}$ of glycerine; potassium alum 1 in 3 of glycerine. Insoluble in rectified and proof spirit.

Dose.—10 to 20 grains.

Therapeutics.—Astringent in small doses, and purgative in large ones. Used as a gargle for relaxed sore throat, and as an injection in leucorrhœa. Has been recommended in the treatment of whooping-cough, and as an emetic in infantile laryngitis.

Incompatibles.—Alum must not be given with alkalies and their carbonates; or with infusions and decoctions containing tannin, tartrates, salts of lead, barium, and calcium.

ALUMEN EXSICCATUM. DRIED ALUM.

$Al_2 3SO_4, K_2SO_4$.

Preparation.—The potassium alum is heated till it liquefies; the heat is raised and continued, not being allowed to exceed 400° F. (204°·4 C.), until aqueous vapour is no longer disengaged. The residue is then reduced to powder, and preserved in a well-stoppered bottle, as it absorbs water rapidly from the atmosphere.

Character.—It is slowly but completely soluble in water.

Use. Only employed externally for removing fungous flesh. Its action is escharotic.

TESTS FOR THE SALTS OF ALUMINIUM.

Aluminium salts are known by their solutions giving white precipitates with caustic alkalies soluble in excess, and white precipitates with ammonia insoluble in excess. These salts, also, when heated on charcoal with solution of cobalt, acquire an ultramarine blue colour.

CERIUM. Ce = 141.

CERII OXALAS. OXALATE OF CERIUM. $CeC_2O_4.3H_2O$.

Preparation.—This salt may be obtained as a precipitate by adding solution of oxalate of ammonium to a soluble salt of cerium, such as the chloride ($CeCl_2$).

Characters and Tests.—A white granular powder, insoluble in water, decomposed at a dull red heat into a reddish-brown powder, which dissolves completely and without effervescence in boiling hydrochloric acid, and the resulting solution gives, with solution of sulphate of potassium, a white crystalline precipitate (sulphate of cerium and potassium). May contain a trace of alumina. If the salt is boiled with solution of potash and filtered, the filtrate is not affected by solution of chloride of ammonium, but when supersaturated with acetic acid it

gives, with chloride of calcium, a white precipitate, which is soluble in hydrochloric acid.

Dose.—1 to 2 grains.

Therapeutics.—A local sedative and tonic. It has been used in irritable dyspepsia, gastrodynia, pyrosis, and chronic vomiting. It has enjoyed much repute in the vomiting of early pregnancy and in sea-sickness ; it is also given in epilepsy and chorea, in nervous palpitation, and convulsive cough. It does not produce discoloration of the skin, as when nitrate of silver is used.

CHROMIUM. Cr = 52·5.

ACIDUM CHROMICUM. CHROMIC ACID. CrO_3.

This is an anhydride, properly speaking, and not an acid. The proper symbol for chromic acid is H_2CrO_4.

Preparation.—It may be obtained by the addition of strong sulphuric acid to bichromate of potassium.

Characters and Tests. Crimson acicular crystals, very deliquescent, inodorous, corrosively caustic to the skin. Chromic acid melts at a high temperature, and at a still higher temperature it decomposes, evolving oxygen gas, and leaving a greenish-black residue. Warmed with hydrochloric acid, chlorine is set free. When mixed with cold alcohol, aldehyde is evolved, and a green residue left. Solubility, about 2 in 1 of water, forming a deep orange-red solution.

When placed in contact with alcohol, glycerine, and some other organic matters, sudden combustion or explosion may follow. It may contain a trace of sulphuric acid.

Use. A powerful caustic and antiseptic, used to remove warty excrescences, and applied to indolent ulcers, putrid sores, and cancers.

Official Preparation. —Liquor Acidi Chromici. Solution of chromic acid. A solution containing the equivalent of 25 per cent. of anhydrous chromic anhydride, CrO_3 ; or 29·5 per cent. of real chromic acid, H_2CrO_4. It is prepared by dissolving chromic acid in distilled water. An orange-red inodorous caustic strongly acid liquid : = (1 in $3\frac{1}{2}$).

MANGANESIUM, Mn=55.

MANGANESII OXIDUM NIGRUM. BLACK OXIDE OF MANGANESE. MnO_2.

Characters and Tests.—A heavy black powder, found native, which dissolves almost entirely in hydrochloric acid with evolution of chlorine, and gives off oxygen when heated to redness.

Used in producing *Chlorine* and *Permanganate of Potassium.*

Therapeutics.—Very seldom employed medicinally. It somewhat resembles iron in its action. The protosulphate of manganese in small doses, and the carbonate of manganese have been given with the idea of improving the blood in anæmia. The purified oxide of manganese has been given for the relief of pyrosis.

ARSENIUM. ARSENIC. As=75.

ARSENII IODIDUM. IODIDE OF ARSENIUM. AsI_3.

Preparation.—Obtained by the direct combination of iodine and metallic arsenium, or by evaporating to dryness an aqueous mixture of arsenious and hydriodic acids.

Characters and Tests.—Small orange-coloured crystals readily and almost entirely soluble in water and rectified spirit. The aqueous solution is neutral in reaction, and gives a yellow precipitate with sulphuretted hydrogen. When heated in a test-tube it volatilises almost entirely, liberating violet vapours of iodine.

Dose.—$\frac{1}{30}$ of a grain.

It is used in the preparation of the following :—

ARSENII ET HYDRARGYRI IODIDI LIQUOR.—Solution of iodide of arsenium and mercury (Donovan's solution).

Preparation.—Iodide of arsenium and red iodide of mercury, 48 grains of each, are triturated with about $1\frac{1}{2}$ ounce of distilled water, until nearly all is dissolved. The solution

is passed through a filter, and the latter washed with sufficient water to produce ten fluid ounces of solution.

Characters.—A clear pale yellow liquid with a metallic flavour. One fluid ounce contains about $\frac{1}{160}$ of a molecular weight in grains (about 1 per cent. by weight) of arsenious iodide, AsI_3, and of mercuric iodide, HgI_2.

Dose.—10 to 30 minims.

Therapeutics. -Iodide of arsenium is given in skin diseases in the form of pills containing $\frac{1}{30}$ to $\frac{1}{15}$ of a grain. Donovan's solution is serviceable in tertiary forms of syphilis. It may be used externally as a lotion in similar cases, when freely diluted.

ACIDUM ARSENIOSUM. ARSENIOUS ACID. As_2O_3.

Preparation.—An anhydride (not a true acid) obtained by roasting arsenical ores, and purified by sublimation. During the smelting of arseniurets this acid is collected in flues ; it is subsequently purified by heating in a thin porcelain capsule, covered with a glass flask which is filled with cold water ; the substance rising in vapour is condensed on the bottom of the flask.

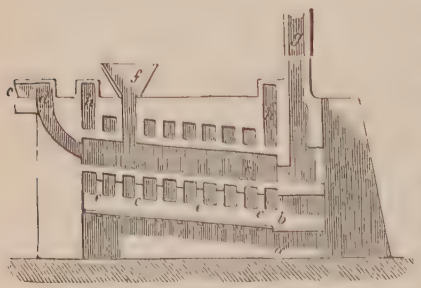


FIG. 66. Section of roasting furnace.

a, ashpit ; *b*, fireplace ; *e*, *e*, *e*, brick arches for supporting the muffle ; *c*, earthen muffle for receiving the ore ; *d*, passage for the fumes into the condensing chamber ; *f*, hopper for introducing the ore ; *h*, *h*, flue ; *g*, vent for protecting the workmen from the arsenical fumes.

At Altenburg, in Silesia, arsenious acid is obtained from *mispickel*, a compound containing sulphur, iron, and arsenium. After being reduced to powder, the ore is roasted in a muffle furnace (fig. 66), by which the arsenium is converted into arsenious acid, which is conveyed in the state of vapour, called *flowers of arsenic*, into the condensing chamber (fig. 67), where it is deposited in a pulverulent form.

In this state it is called *rough arsenious acid*. The rough acid is refined by sublimation: this is effected in cast-iron pots (fig. 68), to which are attached cylindrical heads (*d*), at their

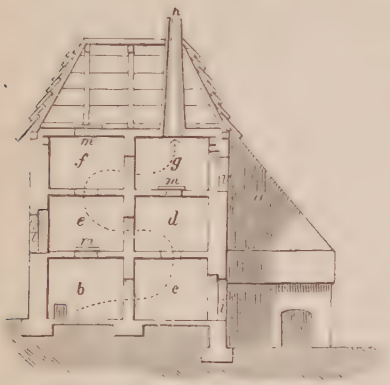


FIG. 67.—Condensing chamber.

b, *c*, *d*, *e*, *f*, *g*, *h*, course of the vapour; *i*, *i*, *i*, doors into the chamber; *m*, *m*, *m*, communication between the floors.

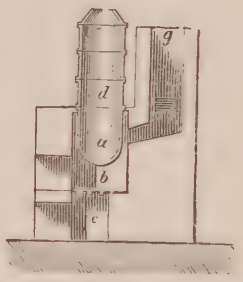


FIG. 68.—Refining furnace.

a, cast-iron pot; *b*, fireplace; *c*, ashpit; *d*, cylindrical head contracted into *e*, cone; *g*, chimney.

tops contracted into cones (*e*), each ending in a pipe made of sheet-iron, and communicating with the condensing chamber (fig. 67). Heat is applied for some hours, by which the acid is sublimed and condensed on the sides of the iron head as a glassy mass, called *glacial white arsenic*.

Characters and Tests.—Occurs as a heavy white powder or in sublimed masses, which usually present a stratified appearance, caused by the existence of separate layers differing from each other in degrees of opacity. It is transparent and glass-like (vitreous) when freshly prepared, but becomes opaque after a time, and resembles porcelain. When slowly sublimed in a glass tube (fig. 69) it forms minute, brilliant, and transparent crystals under the microscope, showing usually regular

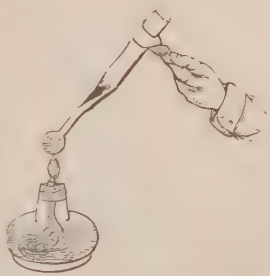


FIG. 69.—Berzelius's reduction tube.

octahedrons (figs. 3, 70), but sometimes tetrahedrons (fig. 71). It is sparingly soluble in cold water, more soluble in boiling water, and its solution gives, with ammonio-nitrate of silver,

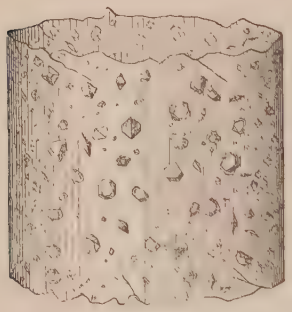


FIG 70.—Magnified portion of a tube lined by the sublimed crystals of arsenious acid, showing regular octahedrons and their modifications.

FIG. 71.—Regular tetrahedron.

FIG. 73. — Right rhombic prism of orpiment.

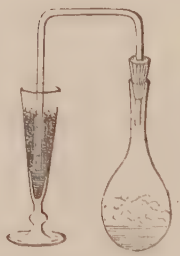


FIG. 72.

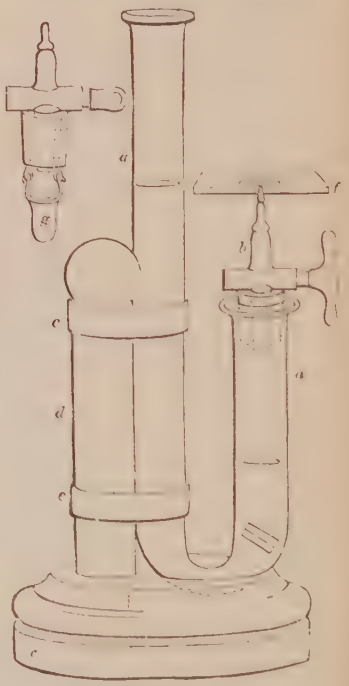


FIG. 74.—Marsh apparatus.

a, a syphon tube; *b*, stopcock; *c*, wooden block; *d*, the pillar; *e*, *e*, caoutchouc slips, to fasten the tube to the pillar; *f*, plate of mica or glass; *g*, small glass bucket, into which, when the quantity to be examined is very small, it is placed with the acid and zinc, and attached to the stopcock by platinum wire, and then introduced into the short leg of the syphon previously filled with water.

a canary-yellow precipitate of arsenite of silver (Hume's yellow), insoluble in water, but readily dissolved by ammonia and by nitric acid. With ammonio-sulphate of copper it gives a green

precipitate of arsenite of copper (Scheele's green). If sulphuretted hydrogen gas be passed into a solution of arsenious acid, and a few drops of hydrochloric acid be added (fig. 72), a yellow precipitate of *orpiment*, the trisulphide of arsenic (fig. 73), falls.

Arsenium may also be detected by the nascent hydrogen or Marsh's test. Hydrogen is generated by the action of diluted sulphuric acid upon metallic zinc; the arsenium is then added and the gas lighted. This burns with a pale blue flame and forms a deposit upon a white porcelain plate held in it. The deposit is soluble in chlorinated lime. The various modes of applying Marsh's test are shown in figs. 74, 75, 76. In fig. 77

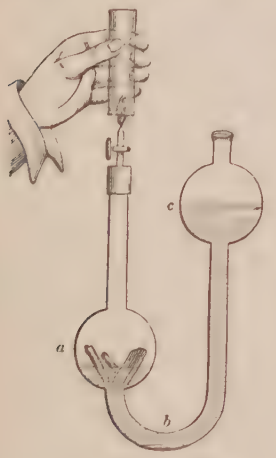


Fig. 75.—Modification of Marsh's apparatus.
a, *a*. bulbs; *b*, cross-piece.

Fig. 76.—Simple mode of applying Marsh's test, consisting of a two-ounce wide-mouthed phial with a cork perforated by a glass tube or tobacco-pipe.

is seen the method of subjecting arseniuretted hydrogen to the action of heat or of nitrate of silver. Sprinkled on red-hot coal arsenious anhydride emits an odour of garlic.

It may contain traces of carbonate and sulphate of calcium.

Dose.—$\frac{1}{60}$ to $\frac{1}{12}$ of a grain, in solution.

Official Preparations. — (1) Liquor Arsenicalis. Arsenical solution. Fowler's solution. Arsenious acid and carbonate of potassium are heated with water until a clear solution is obtained. This is cooled, and to it compound

tincture of lavender and distilled water are added. Arsenite of potassium is formed.

Characters.—A reddish liquid, alkaline to test paper, and having the odour of lavender. The colour is due to the red sandal wood contained in the compound tincture of lavender.

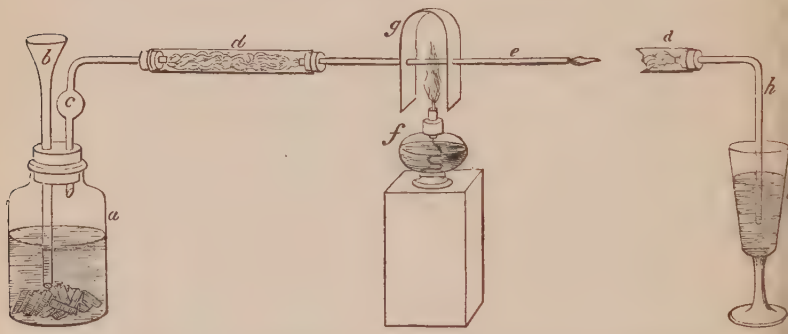


FIG. 77.—Apparatus for subjecting arseniuretted hydrogen to the action of heat or of nitrate of silver.

a, bottle for generating the arseniuretted hydrogen; *b*, funnel, or tube, by which the sulphuric acid and arsenical liquor are introduced into the bottle; *c*, escape tube, supplied with a bulb, to condense any liquid which may rise from the bottle; *d*, wider tube, loosely filled with asbestos (or cotton-wool) to impede the passage of any water (this is not essential); *e*, narrow tube of difficultly fusible glass, drawn out to a fine point at the extremity; *f*, spirit lamp; *g*, curved and perforated metallic plate (copper, zinc, or tinned iron), to support the glass tube in the event of its softening by the heat; *h*, curved glass tube, which may be substituted for the tube *c* when the gas is to be passed through a solution of nitrate of silver; *i*, test-glass, containing a solution of nitrate of silver.

The gas is decomposed by the heat, and the arsenium is deposited in the form of a metallic ring beyond the flame and nearer the aperture.

It contains 1 per cent. of arsenious acid, or rather more than 4 grains ($4\frac{1}{3}$) in one fluid ounce.

Dose.—2 to 8 minims.

(2) LIQUOR ARSENICI HYDROCHLORICUS.—Hydrochloric solution of arsenic. Hydrochloric acid, and arsenious anhydride in powder, are boiled with a sufficiency of distilled water. It is of the same strength as the liquor arsenicalis.

A colourless liquid, acid to test paper.

Dose.—2 to 8 minims.

The following preparations contain arsenic in the form of arsenic anhydride (As_2O_5):—

SODII ARSENIAS. ARSENIATE OF SODIUM.

($Na_2HAsO_4,12H_2O$; and $Na_2HAsO_4,7H_2O$.)

Preparation.—Dry arsenious acid, dry nitrate of sodium, and dried carbonate of sodium are reduced separately to fine powder, and thoroughly mixed. The mixture is placed in a large clay crucible, and exposed to a dull red heat until complete fusion has taken place. The fused salt is then poured on a clean flagstone, and as soon as it has solidified, and while it is still warm, it is placed in boiling water and stirred diligently. When the salt has dissolved, the solution is filtered through paper, and set aside to crystallise. The crystals are drained, and dried rapidly on filtering paper, and enclosed in stoppered bottles.

In this preparation the nitrate of sodium ($NaNO_3$) oxidises the arsenious anhydride (As_2O_3) converting it into arsenic anhydride (As_2O_5), which expels the carbonic anhydride (CO_2) of the carbonate of sodium (Na_2CO_3), and unites with all the soda present to form pyro-arseniate of sodium ($Na_4As_2O_7$), nitrous anhydride (N_2O_3) being also given off in the process. Thus :—

$$As_2O_3 + Na_2CO_3 + 2NaNO_3 = CO_2 + N_2O_3 + Na_4As_2O_7.$$

By solution in water the pyro-arseniate becomes converted into the arseniate. Thus :—$Na_4As_2O_7 + H_2O = 2Na_2HAsO_4$.

Dose.—$\frac{1}{12}$ to $\frac{1}{8}$ of a grain.

Characters.—Colourless transparent prisms, soluble in water. When freshly crystallised, arseniate of sodium has the composition shown in the formula $Na_2HAsO_4,12H_2O$. This salt on exposure loses moisture, and when effloresced has the formula $Na_2HAsO_4,7H_2O$.

Official Preparation.—Liquor Sodii Arseniatis.—Solution of arseniate of sodium. Arseniate of sodium rendered anhydrous by a heat not exceeding 300° F. (148°·9 C.), dissolved in distilled water : = (1 in 100). It is about half the strength of liquor arsenicalis.

Dose.—5 to 10 minims.

Therapeutics.—Similar to those of liquor arsenicalis, but is said to cure eczema more speedily, and to produce less gastric disturbance and less irritability of the conjunctivæ.

FERRI ARSENIAS. ARSENIATE OF IRON. $Fe_3As_2O_8$.

Arseniate of iron, with some oxide.

Preparations. — Sulphate of iron ($FeSO_4$) dissolved in boiling water, and arseniate of sodium (Na_2HAsO_4) dried at 300° F. (148°·9 C.), are mixed together, and to them is added bicarbonate of sodium ($NaHCO_3$) dissolved in distilled water; the white precipitate of arseniate of iron that results is collected and washed until free from sulphate of sodium. The washed precipitate is then dried on porous bricks in a warm air-chamber, the temperature of which should not exceed 100° F. (37°·8 C.), in order as much as possible to avoid oxidation. Thus :—

$$3FeSO_4 + 2Na_2HAsO_4 + 2NaHCO_3 = Fe_3As_2O_8 + 3Na_2SO_4 + 2H_2CO_3.$$

Arseniate of iron, sulphate of sodium, and free carbonic acid are formed. The presence of the free carbonic acid causes the precipitation of the $Fe_3As_2O_8$, which is insoluble in it; it also prevents the liberation of free sulphuric acid, in which the salt is soluble.

Dose.—$\frac{1}{16}$ to $\frac{1}{2}$ grain.

Characters and Tests.—A tasteless amorphous powder of a greenish colour, insoluble in water, but readily dissolved by hydrochloric acid; contains the iron both as ferrous and ferric salt. Boiled with excess of caustic soda and filtered, it gives, when exactly neutralised by nitric acid, the characteristic brick-red precipitate with solution of nitrate of silver, forming arseniate of silver (Ag_3AsO_4). It should be free from sulphate.

Therapeutics.—In small doses arsenical preparations are employed in the treatment of skin diseases of a non-syphilitic origin and in chronic rheumatism of the joints; as nervine tonics in chorea and epilepsy and anæmia; and for their

antiperiodic effects in ague and neuralgia; they should be always given after food. In large doses these preparations produce irritation of the alimentary canal and mucous membrane of the eyes (the conjunctiva); pain in the epigastrium, nausea, and irritation of the eyelids, are therefore indications for discontinuing their use.

The arseniate of sodium may be given in the same cases as arsenious anhydride or the liquor arsenicalis.

The arseniate of iron combines the properties of iron and arsenic; it may therefore be given with advantage in skin diseases associated with anæmia.

Adulterations.—Chalk and gypsum are sometimes mixed with arsenious acid. These substances may be found readily, since they do not sublime by heat.

TESTS FOR THE SALTS OF ARSENIC.

Arsenical compounds are known by forming octahedral crystals when sublimed. The tests for arsenious acid have already been described. Solutions of arsenic acid give a brick-red precipitate with ammonio-nitrate of silver.

ANTIMONIUM. STIBIUM. Sb = 120.

ANTIMONII OXIDUM. OXIDE OF ANTIMONY.

Sb_2O_3.

Preparation.—Obtained by decomposing solution of chloride of antimony ($SbCl_3$) with carbonate of sodium (Na_2CO_3). Thus:—

$$2SbCl_3 + 3Na_2CO_3 = 6NaCl + 3CO_2 + Sb_2O_3.$$

Chloride of sodium, carbonic anhydride, and oxide of antimony are formed.

Characters and Tests.—A greyish-white powder, fusible at a low red heat, insoluble in water, but readily dissolved by hydrochloric acid. The solution, dropped into distilled water, gives a white deposit (the oxychloride of antimony or "powder of algaroth"), at once changed to orange by sulphuretted

hydrogen. It dissolves entirely when boiled with an excess of the acid tartrate of potassium, forming tartarated antimony.

Dose.—1 to 4 grains.

Official Preparation.—PULVIS ANTIMONIALIS. Antimonial Powder. Oxide of antimony, 1 ; and phosphate of calcium, 2. A white powder.

Dose.—3 to 10 grains.

Therapeutics.—Similar to tartar emetic, but its operation is much less active; dissolves slowly in the stomach, and is therefore less likely to cause irritation.

ANTIMONIUM NIGRUM PURIFICATUM. PURIFIED BLACK ANTIMONY.

Native sulphide of antimony, Sb_2S_3, purified from siliceous matter by fusion, and afterwards reduced to fine powder ; should any soluble salt of arsenium be present, it must be repurified by solution of ammonia.

Characters and Tests.—A greyish-black crystalline powder. It dissolves almost entirely in boiling hydrochloric acid, evolving sulphuretted hydrogen.

It is used for the preparation of the *Antimonium Sulphuratum* and the following :—

ANTIMONII CHLORIDI LIQUOR. Solution of Chloride of Antimony.—The purified black antimony slowly dissolved in hydrochloric acid.

Therapeutics.—Powerfully caustic and escharotic. It acts generally without causing much pain, forming a clean healthy ulcer after the eschar has separated ; sometimes applied to cancerous growths, poisoned wounds, and bites of snakes. It is never used internally.

ANTIMONIUM SULPHURATUM. SULPHURATED ANTIMONY.

A mixture containing sulphide of antimony, Sb_2S_3, and oxide of antimony, Sb_2O_3.

Preparation.—Purified black antimony is mixed with sublimed sulphur and solution of soda, and boiled with distilled

water. The liquor is strained, and to it is added diluted sulphuric acid in slight excess. The precipitate is collected and washed until free from sulphuric acid, and it is then dried.

Characters and Tests.—An orange-red powder, readily dissolved by caustic soda, also by hydrochloric acid with the evolution of sulphuretted hydrogen and the separation of sulphur.

Dose.—1 to 5 grains.

Sulphurated antimony is contained in the *Pilula Hydrargyri Subchloridi Composita* or *Plummer's pill.*

Therapeutics.—Alterative, diaphoretic, and emetic, but rather uncertain in its action, from its slight solubility; has been used in the treatment of secondary syphilis, skin eruptions, and chronic rheumatism.

ANTMONIUM TARTARATUM. TARTARATED ANTIMONY. TARTAR EMETIC. $(KSbOC_4H_4O_6)_2H_2O$.

An oxytartrate of potassium and antimony.

Preparation.—Oxide of antimony (Sb_2O_3) and acid tartrate of potassium ($KHC_4H_4O_6$), finely powdered, are mixed with sufficient distilled water to form a paste, and set aside for twenty-four hours. They are then boiled with distilled water and filtered, the clear filtrate being set aside to crystallise, and the crystals subsequently dried.

In the preparation the following reactions take place :

$$Sb_2O_3 + 2KHC_4H_4O_6 = H_2O + 2KSbOC_4H_4O_6.$$

Characters and Tests.—In colourless transparent crystals exhibiting triangular facets, crystallising in rhombic octahedrons, the lateral planes of which are striated (fig. 78), soluble in water, and less so in proof spirit. It decrepitates and blackens upon the application of heat. When heated in a glass or porcelain capsule the salt is charred, evolving the peculiar caramel-like odour of tartaric acid. If a stream of sulphuretted hydrogen gas, generated in the flask *a* (fig. 79), is washed by passing it through water in the bottle *c*, and then conveyed into solution of tartar emetic, slightly acidulated by hydrochloric acid, and

contained in the glass *d*, an orange-red precipitate of amorphous trisulphide of antimony is obtained. When this orange trisulphide is collected and dried, and introduced into a green glass tube, and a current of hydrogen gas is passed over it, the heat of a spirit lamp being applied, sulphuretted hydrogen and metallic antimony are produced (fig. 80). Solution of tartar emetic in water gives, with hydrochloric acid, a white precipitate, soluble in excess, and which is not

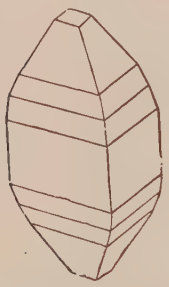


FIG. 78.—Octahedron of tartar emetic.

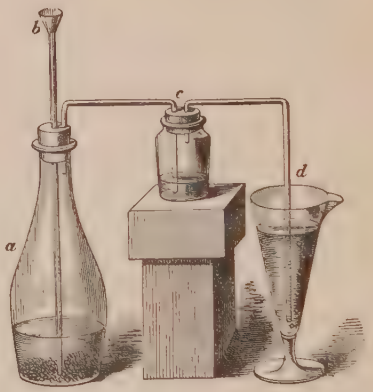


FIG. 79.—Apparatus for passing sulphuretted hydrogen through a solution of tartar emetic.

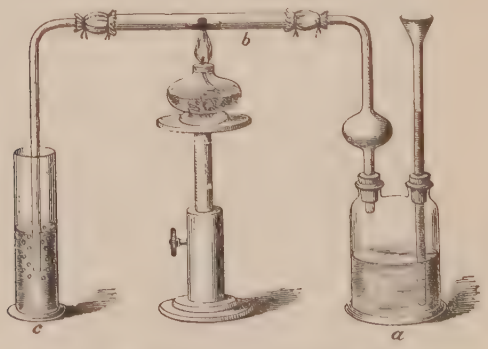


FIG. 80.—Apparatus for reducing trisulphide of antimony.

a, vessel for generating hydrogen; *b*, reduction tube; *c*, vessel containing solution of acetate of lead to detect the sulphuretted hydrogen formed, with which a black precipitate is produced.

formed if tartaric acid be previously added. It is thus distinguished from salts of bismuth, which also yield precipitates with water, but are not dissolved by tartaric acid.

Official Preparations:

(1) VINUM ANTIMONIALE.—Antimonial Wine (tartarated antimony dissolved in sherry). 2 grains of the salt to the ounce: = (1 in 219). Pale yellowish brown.

Dose.—5 minims to 1 fluid drachm.

(2) UNGUENTUM ANTIMONII TARTARATI.—Ointment of Tartarated Antimony. Tartarated antimony in fine powder mixed thoroughly with simple ointment: = (1 in 5). White.

Therapeutics.—Tartar emetic acts as an expectorant, diaphoretic, depressant, and possibly cholagogue. In somewhat large doses it is at first emetic, then occasionally purgative; if continued for some time it exercises a powerful sedative effect upon the vascular system and in all the muscles. Externally it is powerfully irritant, producing pustules resembling those of small-pox, and there is danger of its becoming absorbed, especially in young children. It is employed in febrile conditions to promote secretions, and as a vascular depressant in severe inflammations. It is also used in repeated small doses in midwifery practice in cases of rigid os uteri, or dryness and heat of the maternal passages.

Dose.—As a diaphoretic and expectorant, $\frac{1}{16}$ to $\frac{1}{6}$ grain. As an emetic, 1 to 2 grains.

Incompatibles.—Acids, alkalies and their carbonates, lime, lead, and astringent vegetable infusions.

TESTS FOR THE SALTS OF ANTIMONY.

Antimony salts are known by their solutions giving an orange precipitate with sulphuretted hydrogen and by the chloride yielding a white precipitate when thrown into water.

BISMUTHUM. BISMUTH. Bi = 209

A crystalline metal used in preparing Bismuthum Purificatum. In its crude state it is impure.

BISMUTHI CARBONAS. CARBONATE OF BISMUTH.

$(Bi_2O_2CO_3)_2,H_2O$.

Preparation.—Nitric acid is mixed with distilled water and purified bismuth is added in order to form nitrate of bismuth; the mixture is then boiled and decanted from insoluble matter.

The solution is concentrated by evaporation and added to a cold solution of carbonate of ammonium.

The precipitate (the hydrated oxycarbonate) is collected and washed and finally dried.

Characters and Tests.—A white powder, blackened by sulphuretted hydrogen; insoluble in water. If to nitric acid mixed with half its volume of distilled water as much carbonate of bismuth be added as the acid will dissolve, one volume of this solution poured into twenty volumes of water will yield a white precipitate. The solution should be free from lead and chloride.

Dose.—5 to 20 grains.

Therapeutics.—Acts similarly to the subnitrate and is often preferred to it.

BISMUTHI SUBNITRAS. SUBNITRATE OF BISMUTH.

BiO,NO_3,H_2O.

Preparation.—Nitric acid is mixed with distilled water and purified bismuth is added. The mixture is boiled and decanted from insoluble matter. The solution is concentrated by evaporation and poured into distilled water. The subnitrate is thus precipitated, the supernitrate of bismuth remaining in solution. The former salt is collected, added to distilled water, and again collected and dried.

Characters.—A heavy white powder in minute crystalline scales, insoluble in water.

Dose.—5 to 20 grains in powder, or suspended by mucilage of tragacanth or gum arabic.

Official Preparation. — TROCHISCI BISMUTHI. Bismuth Lozenges. (Subnitrate of bismuth, heavy carbonate of magnesium, precipitated carbonate of calcium, refined sugar, gum acacia, mucilage of gum acacia and rose water.) Each lozenge contains 2 grains of the subnitrate of bismuth.

Dose.—1 to 6 lozenges.

Therapeutics.—Internally administered, this salt acts as a direct sedative to the mucous membrane of the stomach and intestines. It is much used in the treatment of irritative dyspepsia, especially when accompanied by pyrosis or water-brash. It is said to be valuable in checking the diarrhœa of phthisis. Externally it is used as a topical sedative in chronic skin diseases, and as an injection in gleet and leucorrhœa. Has been largely employed as a cosmetic for giving the peculiar whiteness to the complexion termed enamelling, but it is very liable to become blackened by an impure atmosphere.

Adulterations.—It may contain carbonate of lead, and occasionally arsenic.

BISMUTHI OXIDUM. OXIDE OF BISMUTH. Bi_2O_3.

Preparation.—Subnitrate of bismuth is mixed with solution of soda and boiled. After cooling and filtering, the oxide is washed with distilled water and dried.

Characters.—A dull lemon-yellow powder.

Dose.—5 to 15 grains.

Therapeutics.—Similar to the other preparations of bismuth.

BISMUTHUM PURIFICATUM. PURIFIED BISMUTH.

Preparation.—Cyanide of potassium and sulphur mixed together are added to bismuth melted in a crucible. The whole is heated to low redness, the crucible then removed from the fire and allowed to cool until the flux has solidified

to a crust. Two holes are pierced in the crust, and the still fluid bismuth is poured into another crucible. This partially purified bismuth is remelted with a mixture of equal parts of the dried carbonates of sodium and potassium by heating to bright redness. After cooling the bismuth is poured into moulds.

Characters.—A crystalline metal of a greyish-white colour, with a distinct roseate tinge ; composed of brilliant broad plates and readily crystallisable in cubes or regular octahedrons (figs. 3, 70). It should be free from all traces of arsenium, copper, silver, lead, iron, tellurium, and selenium ; the last two metals give a red or black precipitate with sulphate of sodium.

Employed in making the preparations of bismuth.

BISMUTHI CITRAS. CITRATE OF BISMUTH.

$BiC_6H_5O_7$.

Preparation.—Subnitrate of bismuth is dissolved in nitric acid by the aid of heat. The solution is poured into water and stirred until all cloudiness disappears. To the clear solution of bismuth is added a solution of citrate of ammonium (made from bicarbonate of sodium and citric acid boiled until all carbonic acid gas is expelled). The whole is boiled and then allowed to cool, the precipitate of citrate of bismuth being washed until free from nitric acid and finally dried.

Characters.—A white powder, usually containing two and a half per cent. of absorbed moisture. Soluble in solution of ammonia to a clear or nearly clear liquid. Gives a black precipitate with sulphuretted hydrogen, the filtrate from this precipitate (after being boiled free from ammonia) yielding a white precipitate (citrate of calcium) when warmed with lime water.

Dose.—2 to 5 grains. Used for the same purposes as the subnitrate.

Official Preparation.—Liquor Bismuthi et Ammonii Citras. Solution of Citrate of Bismuth and Ammonium. Citrate of bismuth, made into a paste with water, added to solution of ammonia and distilled water.

Characters.—A colourless solution, with a slightly metallic taste, freely miscible with water. One fluid drachm contains an amount of bismuth equivalent to about 3 grains of oxide of bismuth.

Dose.—½ to 1 fluid drachm.

BISMUTHI ET AMMONII CITRAS. CITRATE OF BISMUTH AND AMMONIUM.

Preparation.—This salt is made by evaporating the solution of citrate of bismuth and ammonium to the consistence of a syrup and drying the resulting fluid in thin layers on glass or porcelain plates, the scales being subsequently removed and preserved in stoppered bottles.

Characters.—It occurs in small, shining translucent scales, having a slightly metallic taste, and very soluble in water.

Dose.—2 to 5 grains.

TESTS FOR THE SALTS OF BISMUTH.

Bismuth salts are known by their solutions becoming milky on the addition of water. They also give a black precipitate with sulphuretted hydrogen.

ZINCUM. $Zn = 65$.

ZINCI ACETAS. ACETATE OF ZINC.

$Zn(C_2H_3O_2)_2.2H_2O$.

Preparation.—Carbonate of zinc is added to acetic acid previously mixed with distilled water. The mixture is heated gently, and more acetic acid is added till the carbonate is dissolved. The solution is boiled, filtered, and set aside to crystallise.

Characters and Tests.—Thin, translucent, and colourless crystalline plates, of a pearly lustre, with a sharp, unpleasant taste; evolving acetic acid when decomposed by sulphuric

acid ; soluble in water, and the neutral solution precipitated pure white by sulphuretted hydrogen (zinc sulphide). A diluted watery solution, after boiling for a few minutes with a little nitric acid, yields with ammonia a white precipitate = hydrated oxide of zinc, entirely soluble in an excess of the reagent. It should be free from sulphates, and chlorides, and metallic impurities, as copper, arsenic, lead, and cadmium.

Dose.—1 to 2 grains, as a tonic ; 10 to 20 grains, as an emetic.

Therapeutics.—Astringent ; similar to the sulphate.

ZINCI CARBONAS. CARBONATE OF ZINC. $ZnCO_3(Zn_2HO)_2,H_2O$.

Preparation.—Carbonate of sodium is dissolved in distilled water, and into it is poured a solution of sulphate of zinc in water and the mixture is boiled. The precipitate is washed until free from sulphuric acid, collected and dried.

Characters.—White, tasteless, inodorous, insoluble in water.

Used in the preparation of the acetate, chloride, oxide, and sulphate of zinc.

Dose.—1 to 10 grains in pill or powder

Therapeutics.—Carbonate of zinc may be used in the same cases as the oxide, but it is seldom used medicinally.

ZINCI CHLORIDUM. CHLORIDE OF ZINC. $ZnCl_2$.

Preparation.—Diluted hydrochloric acid is added by degrees to granulated zinc in a porcelain vessel, and gently warmed until gas is no longer evolved. The solution is boiled and filtered, and, when cooled, into it is poured solution of chlorine until the fluid acquires a permanent odour of that gas. Carbonate of zinc is now added until a brown sediment appears. The solution is filtered and evaporated until a portion of the liquid, withdrawn on the end of a glass rod and cooled, forms an opaque white solid. It is now poured out into proper moulds and, when the salt has solidified, but before it has cooled, placed in closely stoppered bottles.

The solution of chlorine is used to remove any iron which

the zinc sometimes contains. Ferrous chloride is converted by it into ferric chloride; thus $2FeCl_2 + Cl_2 = Fe_2Cl_6$.

Upon the addition of the carbonate of zinc ($ZnCO_3$) ferric oxide is precipitated and chloride of zinc is formed; thus

$$Fe_2Cl_6 + 3ZnCO_3 = Fe_2O_3 + 3CO_2 + 3ZnCl_2.$$

Characters.—Colourless, opaque rods or tablets, very deliquescent and caustic; soluble almost entirely in water, alcohol, and ether.

Dose.—$\frac{1}{2}$ to 2 grains.

Official Preparation.—Liquor Zinci Chloridi. Solution of Chloride of Zinc. This solution is prepared from the same ingredients and in the same manner as the zinc chloride, but, at the end of the process, instead of being evaporated to dryness, it is only concentrated by evaporation until it contains 366 grains of zinc chloride to the ounce.

Characters.—A colourless fluid of astringent and sweetish taste.

Therapeutics.—A weak solution is given internally, though seldom, in chorea and epilepsy. Externally, it is a powerful escharotic, and is employed in cancer, malignant ulcers, and for the removal of nævi; generally made into a paste with flour or gypsum.

ZINCI OXIDUM. OXIDE OF ZINC. ZnO.

Preparation.—Carbonate of zinc is placed in a loosely covered Hessian crucible, and exposed to a dull red heat, until a portion, taken from the centre of the contents of the crucible and cooled, no longer effervesces when dropped into diluted sulphuric acid = (absence of carbonic acid). After cooling, the product is transferred to stoppered bottles.

It may also be prepared from metallic zinc by combustion, and is white when thus prepared.

Characters.—A soft nearly white tasteless and inodorous powder, becoming pale-yellow when heated.

Dose.—2 to 10 grains in pill or powder.

Official Preparation.—Unguentum Zinci. Zinc Ointment. Oxide of zinc and benzoated lard: = (1 in $6\frac{1}{2}$). Cream-coloured.

Therapeutics.—In small doses tonic and astringent, acting upon the nervous system, and useful in checking excessive perspiration. Employed in chorea, epilepsy, hysteria, neuralgia, and whooping cough. In large doses it causes vomiting. Externally it is applied to ulcerated and excoriated surfaces.

ZINCI SULPHAS. SULPHATE OF ZINC. $ZnSO_4,7H_2O$.

Preparation.—This salt is prepared in an exactly similar manner to the chloride of zinc, with the exception that sulphuric acid is employed in the place of hydrochloric acid, the sulphate of zinc being purified from any ferrous sulphate ($FeSO_4$) that may be present by the addition of solution of chlorine and carbonate of zinc ; thus

$$2FeSO_4 + 2Cl + ZnCO_3, 2ZnO = Fe_2O_3 + ZnCl_2 + CO_2 + 2ZnSO_4$$

Ferric oxide, chloride of zinc, carbonic anhydride, and sulphate of zinc are formed.

Characters.—In colourless, transparent right rhombic prismatic crystals (fig. 81) with a strong metallic styptic taste. It should be free from iron, copper, lead, and arsenic.

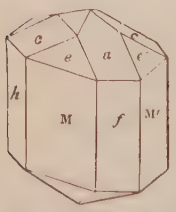


FIG. 81. Crystal of sulphate of zinc.

Dose.—1 to 3 grains, as a tonic or astringent ; 10 to 30 grains, as an emetic.

Therapeutics.—In *large* doses a prompt emetic ; useful in opium and other poisoning. Also given in phthisis and those forms of dyspepsia in which free emptying of the stomach is desirable, without producing much depression. In small doses tonic and astringent ; given in chorea, epilepsy, and hysteria. It is also employed as an injection in leucorrhœa and gleet, and as a collyrium in affections of the eye, or a wash for indolent ulcers.

ZINCI VALERIANAS. VALERIANATE OF ZINC. $Zn(C_5H_9O_2)_2$.

Preparation.—Sulphate of zinc and valerianate of sodium are each dissolved in water. The solutions are heated to nearly the boiling point, mixed and cooled, and the crystals that

are formed are skimmed off. More crystals are obtained from the mother liquor. They are then washed until free from sulphate and finally dried.

Characters and Tests.—In brilliant white pearly tabular crystals, with a feeble odour of valerianic acid, and a metallic taste; scarcely soluble in cold water or in ether, soluble in hot water and alcohol. It gives when heated with diluted sulphuric acid a distillate (valerianic acid), which, when mixed with the solution of acetate of copper, does not immediately affect the transparency of the fluid (freedom from butyric acid), but forms after a little time oily drops, which gradually pass into a bluish-white crystalline deposit (valerianate of copper). It has been stated that commercial valerianate of zinc chiefly consists of butyrate of zinc.

Dose.—1 to 3 grains.

Therapeutics.—An antispasmodic and nervine tonic, used in hysteria, chorea, epilepsy, and neuralgic affections, and those cases in which the combined effect of valerian and zinc appears desirable.

ZINCUM GRANULATUM. GRANULATED ZINC.

Preparation.—Zinc of commerce is fused in an earthen crucible, and poured in a thin stream into a bucket of cold water. The water is drained off and the granulated zinc dried.

ZINCI SULPHOCARBOLAS. SULPHOCARBOLATE OF ZINC. $Zn(C_6H_5SO_4)_2H_2O$.

Preparation.—May be obtained by heating a mixture of carbolic acid and sulphuric acid, saturating the product with oxide of zinc, evaporating and crystallising.

Characters and Tests.—Colourless, transparent, tabular, efflorescent crystals. Soluble in water. The aqueous solution gives a white precipitate with sulphydrate of ammonium, and is coloured violet by perchloride of iron.

Dose.—10 to 15 grains.

Therapeutics.—Antipyretic and antiseptic, employed in an exactly similar manner to the sodium sulphocarbolate.

ZINCI OLEATUM. OLEATE OF ZINC.

Preparation.—Oxide of zinc (1) and oleic acid (4) stirred and heated; used in preparing the

Official Preparation.—Unguentum Zinci Oleati. Ointment of Oleate of Zinc. Oleate of zinc and soft paraffin in equal parts mixed with a little heat, and stirred until nearly cold. (For the use of the Oleates see Oleic Acid, page 76.)

TEST FOR THE SALTS OF ZINC.

Zinc salts are known by their solution giving a white precipitate with sulphide of ammonium.

STANNUM. TIN. Sn=118.

SOLUTION OF STANNOUS CHLORIDE.

The solution of protochloride of tin is prepared by dissolving granulated tin in hydrochloric acid and distilled water. It is a powerful deoxidising agent, very readily absorbing oxygen and also chlorine. It reduces the salts of silver, gold, and mercury. When the hydrargyrum ammoniatum (NH_2HgCl) is boiled with solution of stannous chloride, the former loses chlorine and becomes grey, the mercury being reduced to the metallic condition.

PLUMBUM. LEAD. Pb = 207

PLUMBI ACETAS. ACETATE OF LEAD

$Pb(C_2H_3O_2)_2.3H_2O$

Preparation.—By mixing diluted acetic acid and water, then adding oxide of lead (in fine powder), and dissolving with the aid of a little heat; lastly filtering, evaporating, and crystallising.

Characters and Tests.—In white crystalline masses, the crystals belonging to the oblique prismatic system (fig. 82), slightly efflorescent, having an acetous odour, and a sweet astringent taste. Its solution in water slightly reddens litmus, gives a yellow precipitate with iodide of potassium, and a black precipitate with sulphuretted hydrogen, and is precipitated white by sulphuric acid, acetic acid being set free. Its solution in distilled water is clear, or has only a slight milkiness, which disappears on the addition of acetic acid.

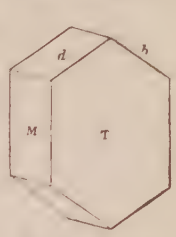


Fig. 82.—Crystal of acetate of lead.

Dose.—1 to 4 grains.

Official Preparations.—(1) Pilula Plumbi cum Opio. Pill of Lead and Opium. Acetate of lead and opium (in fine powder) and confection of roses. 1 grain of opium is contained in 8 grains of the pill mass. Intense brown.

Dose.—3 to 5 grains.

(2) Suppositoria Plumbi Composita.—Compound Lead Suppositories. Acetate of lead, opium in powder, and oil of theobroma. 3 grains of acetate of lead and 1 grain of opium are contained in each suppository.

(3) Unguentum Plumbi Acetatis.—Ointment of Acetate of Lead. Acetate of lead, and benzoated lard, 12 grains to the ounce : = (1 in 37½). White.

Unguentum Glycerini Plumbi Subacetatis.—Ointment of glycerine of subacetate of lead. Glycerine of subacetate of lead, hard and soft paraffins.

LIQUOR PLUMBI SUBACETATIS. SOLUTION OF SUBACETATE OF LEAD.

Prepared from acetate of lead, oxide of lead, and distilled water. Should contain 24 per cent. of subacetate of lead ($Pb_2O(C_2H_3O_2)_2$). It is a dense clear colourless liquid, with a sweet astringent taste and alkaline reaction.

Official Preparations.—(1) Liquor Plumbi Subacetatis Dilutus. Diluted Solution of Subacetate of Lead. Solution

of subacetate of lead, rectified spirit, and distilled water. This is usually known as Goulard water = (1 in 80); it is slightly opaque, with a deposit.

(2) Glycerinum Plumbi Subacetatis. Glycerine of subacetate of lead (see page 44).

Therapeutics of the Lead Salts.—In small doses acetate of lead is sedative and astringent, diminishing morbid mucous discharges and hæmorrhages, and even the natural secretions. It is employed medicinally to check hæmorrhages, for the treatment of diarrhœa and dysentery, and to lessen the expectoration and excessive sweatings of phthisis. The liquor plumbi subacetatis is only used externally for sprains and bruises. In larger doses it induces constipation, thirst, and the well-known painters' colic, accompanied by the blue line round the gums. When long continued, wasting of the body results, the nervous system becomes affected, neuralgic pains occur in the limbs, and eventually the extensors of the hand and flexors of the thumb lose power (dropped wrist, figs. 83, 84). Some-

Fig. 83.

Fig. 84.

Wrist-drop and emaciated condition of the flexors of the thumb in the paralysis from lead.

times complete paralysis supervenes. Anæmia is one of the marked effects of the use of lead preparations. From the prevalence of gout in painters and plumbers, it seems probable that lead, when taken for any long period, causes impregnation of the blood with uric acid. The above-mentioned serious symptoms are generally produced by contact with lead, either by the nature of the occupation or by drinking water containing the metal.

PLUMBI CARBONAS. CARBONATE OF LEAD.

$2Pb_2CO_3,PbO,H_2O$.

Preparation.—This substance, which is also known as White Lead, is a mixture of the carbonate and hydrate of lead, and is prepared by the exposure of sheets of metallic lead to the action of air and to acetic and carbonic acid fumes from vinegar and spent tan.

Characters and Tests—A soft heavy white powder, insoluble in water. May contain traces of lime.

Official Preparation.—Unguentum Plumbi Carbonatis. Ointment of Carbonate of Lead. Carbonate of lead, and simple ointment : = (1 in 8). Cream colour and inodorous.

Therapeutics.—Carbonate of lead is only employed externally as a local astringent and sedative. It may be used in the form of the ointment, or powdered upon inflamed and excoriated surfaces, either alone or mixed with starch.

PLUMBI IODIDUM. IODIDE OF LEAD. PbI_2.

Preparation.—By mixing solutions of nitrate of lead and iodide of potassium, then collecting the precipitate, washing it and drying.

Characters and Tests.—A bright yellow powder ; fuses at a moderate heat, but decomposes at a high temperature, evolving violet vapours of iodine.

Official Preparations.—(1) Emplastrum Plumbi Iodidi. Iodide of Lead Plaster. Iodide of lead, lead plaster, and resin : = (1 in 10). Pale orange.

(2) Unguentum Plumbi Iodidi.—Iodide of Lead Ointment. Iodide of lead, and simple ointment : = (1 in 8).

Bright orange.

Therapeutics.—Externally a mild stimulant, used as the plaster or ointment for scrofulous enlargement of glands and joints, and in goitre. The ointment is a very valuable application for glandular enlargements, especially in children.

PLUMBI NITRAS. NITRATE OF LEAD. $Pb(NO_3)_2$.

Preparation.—By dissolving metallic lead or oxide of lead in diluted nitric acid, filtering and crystallising.

Characters and Tests.—In colourless octahedral crystals which are nearly opaque, permanent in the air, of a sweetish astringent taste, soluble in water and in alcohol. Nitrate of lead when added to sulphate of indigo discharges the colour, showing the presence of a nitrate.

It is used in the preparation of *Plumbi Iodidum.*

PLUMBI OXIDUM. OXIDE OF LEAD. PbO.

Preparation.—The yellow oxide or litharge is made during the cupellation of lead ores containing silver, the oxide becoming semi-vitrified or fused.

Characters.—In heavy scales of a pale brick-red colour. It should be free from copper or iron, otherwise it will not make a white plaster.

Official Preparation.—Emplastrum Plumbi. Lead Plaster. Oxide of lead, in fine powder, olive oil, and water. Pale yellow.

Therapeutics.—Only for external application to abate inflammation. The plaster, in which the lead is combined with oleic and margaric acids, is used as a mechanical support.

TESTS FOR THE SALTS OF LEAD.

The lead salts are known by giving a black precipitate with sulphuretted hydrogen, and a yellow precipitate with iodide of potassium.

FERRUM. IRON. Fe = 56.

Annealed iron wire, having a diameter about 0·005 of an inch (about No. 35 wire gauge), or wrought-iron nails; free from oxide.

Official Preparations.—Mistura Ferri Aromatica. Aromatic Mixture of Iron. Fine iron wire, red cinchona bark, and calumba root in powder, cloves bruised, compound tincture of cardamoms, tincture of orange peel, and peppermint water. Intense brown.

Dose.—1 to 2 fluid ounces.

Pilula Ferri Iodidi. Pill of Iodide of Iron. Fine iron wire is agitated with iodine and water in a strong stoppered phial until the froth becomes white. The fluid is then poured upon powdered refined sugar in a mortar, triturated briskly, and powdered liquorice root added gradually. $3\frac{1}{2}$ grains contain 1 grain of iodide of iron.

Dose.—3 to 8 grains.

Syrupus Ferri Iodidi. Syrup of the Iodide of Iron. Fine iron wire, iodine, and water are digested together and shaken until the froth of the mixture becomes white; syrup (refined sugar and water) is now added and the mixture boiled and filtered. Each fluid drachm contains 4·3 grains of iodide of iron.

Dose.—$\frac{1}{2}$ to 1 fluid drachm.

Fine iron wire is also employed in the preparation of *Vinum Ferri* (page 161).

Therapeutics.—The above pill and syrup combine the properties of iron and iodine and are valuable in the treatment of scrofulous diseases requiring iron. They may be given in phthisis in combination with cod-liver oil; occasionally in rheumatic arthritis, and in certain forms of syphilis.

Therapeutics of the iron preparations:—

Iron forms an essential part of the red corpuscles of the blood; $6\frac{1}{2}$ per cent. of iron is contained in the pure colouring matter or hæmatin. When this metal is absent from the blood, anæmia is produced. The salts of iron all exercise the same influence; it cannot be said that one is superior to another. In addition to their hæmatinic property, they directly influence the nervous system, in chorea, epilepsy, neuralgia, and hysteria. The majority of the preparations are astringent, and are, therefore, liable to cause constipation; it is consequently expedient to combine them with some mild aperient, as aloes. The

persalts are certainly the most astringent. All preparations of iron render the fæces black – due to the formation of the black sulphide of iron and possibly of some little tannate of iron.

FERRI PERCHLORIDI LIQUOR FORTIOR (FERRI PERCHLORIDUM. Fe_2Cl_6). STRONGER SOLUTION OF PERCHLORIDE OF IRON.

Preparation.—Diluted hydrochloric acid is poured upon iron wire, and the resulting solution is boiled. It is then poured into nitric acid and evaporated until a precipitate begins to form. More hydrochloric acid and water are then added.

Characters.—An orange-brown solution miscible in all proportions with water and with alcohol. Contains 20 per cent. of iron. It is used in the preparation of the following :

Liquor Ferri Perchloridi. Solution of Perchloride of Iron. Strong solution of perchloride of iron and distilled water. This is of the same strength as the tincture following, viz. : 1 in 4.

Dose.—10 to 30 minims in water.

Tinctura Ferri Perchloridi. Tincture of Perchloride of Iron. Strong solution of perchloride of iron (1) ; rectified spirit (1) ; distilled water up to (4). Light brown.

Dose.—10 to 30 minims in water.

Therapeutics.—One of the most valuable preparations of iron, useful in passive hæmorrhages and other discharges, and in erysipelas. It is much employed as a blood-restorer. Given in diabetes, albuminuria, gleet, anæmia, chlorosis, and epilepsy.

FERRI SUBCHLORIDI SYRUPUS. SYRUP OF SUBCHLORIDE OF IRON. (FERROUS CHLORIDE. $FeCl_2$.)

This is also called "Syrup of Ferrous Chloride."

Preparation.—Hydrochloric acid is mixed with distilled water in a flask, iron wire is added, and heat is applied gently until action ceases. The flask is removed from the source of

heat, citric acid is added, and the solution filtered into syrup. It forms an elegant light-green syrup.

Dose.—½ to 1 fluid drachm.

FERRI PERNITRATIS LIQUOR (FERRI PERNITRAS. $Fe_2(NO_3)_6$). SOLUTION OF PERNITRATE OF IRON.

Preparation.—Fine iron wire, free from rust, is dissolved in nitric acid and distilled water.

Dose.—10 to 40 minims.

Therapeutics.—Astringent and tonic, and used in the same cases for which the perchloride is prescribed. It is useful in chronic diarrhœa, especially in delicate nervous females, and in menorrhagia; used as a diluted injection in leucorrhœa.

LIQUOR FERRI DIALYSATUS. DIALYSED SOLUTION OF IRON.

This is a solution of highly basic ferric oxychloride, or chloroxide of iron, from which most of the acidulous matter has been removed by dialysis.

Preparation.—Into strong solution of perchloride of iron mixed with water, diluted solution of ammonia is stirred until the mixture is decidedly ammoniacal. The mixture is filtered and the precipitated ferric hydrate washed and squeezed to remove superfluous moisture. It is then added to some more solution of perchloride of iron, stirred and warmed, and when complete or nearly complete solution is obtained, the liquid is placed in a covered dialyser. It is then subjected to a stream of water until the solution in the dialyser is nearly tasteless.

Character.—A clear, dark reddish-brown liquid, free from any marked ferruginous taste. Neutral to test-papers. Should contain no trace of ferric salt or of chloride.

Dose.—10 to 30 minims.

Therapeutics.—Of all the iron preparations this solution is considered to be the least irritating and objectionable.

It has been urged that being a colloid substance it can be of no use as a medicine, but it is undoubtedly assimilated, and

it certainly possesses marked hæmatinic qualities. The iron is very easily thrown out of this solution, and it undoubtedly undergoes change in the stomach. Dialysed iron may be employed as an antidote in poisoning by arsenic.

FERRUM REDACTUM. REDUCED IRON.

Metallic iron, with a variable amount of oxide of iron.

Preparation.—Hydrated peroxide of iron (made by precipitating strong solution of perchloride of iron with solution of ammonia) is placed in a gun-barrel, confining it to the middle part of the tube by plugs of asbestos. The gun-barrel is passed through a furnace, and traversed by a stream of hydrogen gas (developed by the action of diluted sulphuric acid on zinc). The gas before entering the gun-barrel is rendered quite dry by being made to pass first through sulphuric acid, and then through a tube packed with small fragments of chloride of calcium. The farther end of the gun-barrel is connected with a bent tube dipping under water; as soon as the hydrogen passes through the water at the same rate that it bubbles through the sulphuric acid, the furnace is allowed to cool down to the temperature of the atmosphere, the current of hydrogen being still continued, since the hot metal is very liable to become oxidised while in a state of minute division. The reduced iron is finally withdrawn, and enclosed in a dry stoppered bottle.

Characters and Tests.—A fine greyish-black powder, strongly attracted by the magnet, and exhibiting metallic streaks when rubbed with firm pressure in a mortar. It dissolves in hydrochloric acid with the evolution of hydrogen, and the solution gives a light-blue precipitate with the ferrocyanide of potassium, showing absence of peroxide of iron.

Dose.—1 to 5 grains.

Official Preparation.—Trochisci Ferri Redacti. Lozenges of Reduced Iron. Reduced iron, refined sugar, gum acacia, in powder, mucilage of gum acacia, and distilled water.

Each lozenge contains 1 grain of reduced iron. Iron-grey.

Dose.—1 to 6 lozenges with a meal.

Therapeutics.—It is a very powerful agent in restoring the condition of the blood in all anæmic states, and is given when it is desirable to obtain the effect of iron without its astringency. It sometimes, however, causes nauseous eructations of sulphuretted hydrogen.

Adulterations.—These may consist of some sulphide, or the magnetic oxide with silicic and mechanical impurities

FERRI SULPHIDUM. SULPHIDE OF IRON. FeS.

May be obtained by combining its elements (iron and sulphur) in proper proportions by the aid of heat.

It is produced by applying the end of a rod of iron, heated to whiteness at a blacksmith's forge, to the end of a roll of sulphur, and allowing the sulphide of iron as it is formed to run into a vessel of water.

It is used for the production of sulphuretted hydrogen.

FERRI SULPHAS. SULPHATE OF IRON. $FeSO_4.7H_2O$.

Preparation.—Distilled water is poured upon iron wire placed in a porcelain dish; sulphuric acid is then added, and when the disengagement of gas (hydrogen) has nearly ceased, the mixture is boiled. It is then filtered, and the deposited crystals are separated, dried, and preserved in stoppered bottles.

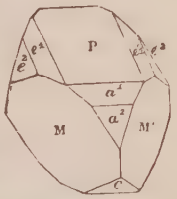


FIG. 85.—Crystal of sulphate of iron.

Characters.—In oblique rhombic prisms (fig. 85), of a pale greenish-blue colour and styptic taste; insoluble in rectified spirit, soluble in water.

Dose.—1 to 5 grains.

FERRI PILULA. IRON PILL.

Official Preparation.—This is commonly known as "Blaud's Pill," and is prepared as follows:

Sulphate of iron is reduced to fine powder, refined sugar and tragacanth in powder are added, and mixed intimately.

Carbonate of potassium is finely powdered in another mortar, and glycerine is thoroughly incorporated with it. This is then transferred to the mortar containing the sulphate of iron, and beaten thoroughly until the mass becomes green, water being added if necessary, sufficient to impart a pilular consistence.

The mass is to be divided into five-grain pills. Each pill contains about one grain of carbonate of iron.

Dose.—1 to 4 pills.

Sulphate of iron is also used in the preparation of the *Pilula Aloes et Ferri*, *Mistura Ferri Composita* (page 159), and of the following.

FERRI SULPHAS EXSICCATA. DRIED SULPHATE OF IRON. $FeSO_4.H_2O$.

Preparation.—Sulphate of iron is heated in a porcelain or iron dish, until aqueous vapour ceases to be given off. The residue is reduced to a fine powder, and preserved in a stoppered bottle. The sulphate of iron loses six molecules of its water of crystallisation. Greyish-cream colour ; especially useful for making pills.

Dose.—$\frac{1}{2}$ grain to 3 grains.

FERRI SULPHAS GRANULATA. GRANULATED SULPHATE OF IRON. $FeSO_4.7H_2O$.

Preparation.—Made in the same manner as the ordinary sulphate of iron viz. from distilled water, iron wire, and sulphuric acid, with the exception that the solution is filtered into a jar containing rectified spirit, the mixture being stirred so that the salt shall separate in minute granular crystals ; these, deprived by decantation of adhering liquid, are transferred on filtering-paper to porous tiles, and dried by exposure to the atmosphere. They should be preserved in a stoppered bottle.

Characters.—In small granular crystals of a pale greenish-blue colour. Corresponds to the characters and tests for sulphate of iron.

Dose.—1 to 5 grains.

Therapeutics.—The same as the other salts of iron, but it is very astringent.

FERRI PERSULPHATIS LIQUOR (FERRI PERSULPHAS. $Fe_2(SO_4)_3$). SOLUTION OF PERSULPHATE OF IRON.

Preparation.—Sulphate of iron is dissolved in diluted sulphuric acid by the aid of heat. The solution is then added to diluted nitric acid, and boiled until the persalt is formed. It is used in the preparation of other iron salts, but not given medicinally. It is very astringent.

FERRI PEROXIDUM HYDRATUM. HYDRATED PEROXIDE OF IRON. $Fe_2O_3.H_2O$.

Preparation.—Solution of soda is added to a diluted solution of persulphate of iron, the resulting ferric hydrate being washed until free from sulphate ; it is then dried and reduced to fine powder.

Character.—A reddish-brown powder, destitute of taste and not magnetic.

Dose.—5 to 30 grains.

Official Preparation.—Emplastrum Ferri. Chalybeate Plaster or Emplastrum Roborans. Hydrated peroxide of iron, in fine powder ; Burgundy pitch ; and lead plaster : = (1 in 11).

Therapeutics.—Non-irritant, and useful when it is desired to give large doses of iron, or to continue its use for a long period. Employed beneficially in neuralgia. The plaster is used for strengthening, and as a mechanical support for relaxed muscles.

FERRI PHOSPHAS. PHOSPHATE OF IRON.

Ferrous phosphate ($Fe_3P_2O_8,8H_2O$), at least 47 per cent., with ferric phosphate and some oxide.

Preparation.—A solution of phosphate of sodium is added to a solution of sulphate of iron, bicarbonate of sodium being

also added. The precipitate is filtered off, washed until free from sulphate, and finally dried. The bicarbonate of sodium is used in order to neutralise the sulphuric acid which is liberated when the solutions of phosphate of sodium and sulphate of iron are mixed together.

Character.—A slate-blue amorphous powder, insoluble in water; contains both ferric and ferrous salts.

Dose.—5 to 10 grains.

Official Preparation. — Syrupus Ferri Phosphatis. Syrup of Phosphate of Iron. Is prepared from granulated sulphate of iron, phosphate of sodium, bicarbonate of sodium, concentrated phosphoric acid, refined sugar, and distilled water; contains the equivalent of about 1 grain of anhydrous phosphate of iron ($Fe_3P_2O_8$) in one fluid drachm. Colourless when fresh; by keeping it gets brown and deposits.

Dose.—1 fluid drachm.

Therapeutics.—Used in diabetes, amenorrhœa, some forms of dyspepsia, and has been recommended for rickets. It is apparently not astringent, and increases the power of digestion.

FERRI ACETATIS LIQUOR FORTIOR. (FERRI ACETAS, $Fe_2(C_2H_3O_2)_6$.) STRONGER SOLUTION OF ACETATE OF IRON.

Preparation.—Solution of ammonia is mixed with distilled water, and to the mixture is added solution of persulphate of iron diluted with water. The whole is stirred together, the ammonia being kept in slight excess. The resulting ferric hydrate is collected and washed (until the filtrate is free from sulphuric acid) and finally dissolved in liquefied glacial acetic acid.

Characters.—A deep red fluid with a sour styptic taste and acetous odour, miscible with water or rectified spirit in all proportions.

Official Preparations.—Liquor Ferri Acetatis. Solution of acetate of iron. Strong solution of acetate of iron and distilled water : = (1 in 4).

Dose.—5 to 30 minims.

Tinctura Ferri Acetatis. Tincture of the acetate of iron. Strong solution of acetate of iron, acetic acid, rectified spirit, and distilled water. Preserved in a stoppered bottle. = (1 in 4).

Dose.—5 to 30 minims as a tonic.

Ferri Arsenias. See Arsenic, page 132.

FERRI CARBONAS SACCHARATA. SACCHARATED CARBONATE OF IRON.

Carbonate of iron ($FeCO_3xH_2O$) mixed with peroxide of iron and sugar, the carbonate (if reckoned as anhydrous) forming about one-third of the mixture.

Preparation.—Solution of sulphate of iron and solution of carbonate of ammonium are mixed together, and the precipitate of carbonate of iron is collected and rubbed with refined sugar, the mixture being finally dried. The sugar protects the carbonate from oxidation.

Characters.—Small coherent lumps of a grey colour, with a sweet very feeble chalybeate taste.

Dose.—5 to 30 grains.

Official Preparation.—Pilula Ferri Carbonatis. Pill of Carbonate of Iron. Saccharated carbonate of iron and confection of roses beaten into a uniform mass : = (1 in $1\frac{1}{4}$). Black. Gets hard by keeping.

Dose.—5 to 20 grains.

Carbonate of iron is also contained in the following preparation (Griffith's mixture).

Therapeutics.—A useful chalybeate and not astringent ; scarcely affects the mucous membrane of the alimentary canal, and serviceable in amenorrhœa associated with anæmia.

Ferri Mistura Composita.—Compound Mixture of Iron. Sulphate of iron, carbonate of potassium, myrrh and refined sugar, spirit of nutmeg, and rose-water.

Carbonate of iron is here formed. Since this salt rapidly decomposes, the mixture should be recently prepared ; it is conveniently kept without the iron salt. The sulphate of iron can be added when required.

Dose.—1 to 2 fluid ounces ; as a stimulating tonic.

FERRI ET AMMONII CITRAS. CITRATE OF IRON AND AMMONIUM.

Preparation.—Diluted solution of persulphate of iron is added to diluted solution of ammonia. The resulting peroxide of iron (washed until free from sulphate of ammonium) is now heated with a solution of citric acid, and stirred until saturation of the ferric hydrate with the acid—acid citrate of peroxide of iron being formed. The solution is cooled, and solution of ammonia is added. It is now filtered, evaporated, dried in thin layers, and kept in a stoppered bottle.

Characters and Tests.—In thin transparent scales of a deep red colour, slightly sweetish and astringent in taste. Soluble in water, but almost insoluble in rectified spirit. Heated with solution of potash, it evolves ammonia and deposits peroxide of iron.

Dose.—5 to 10 grains.

Official Preparation.—VINUM FERRI CITRATIS. Wine of Citrate of Iron. Citrate of iron and ammonium and orange wine : = 1 grain in each fluid drachm. Deep brown.

Dose.—1 to 4 drachms.

Therapeutics.—Possesses very little astringency, and is very effectual as a blood-restorer. It may be employed when more styptic ferruginous preparations are not well borne.

Incompatibles.—Solutions containing tannin, since these turn black, and caustic alkalies, which precipitate the oxide.

FERRI ET QUININÆ CITRAS. CITRATE OF IRON AND QUININE.

Preparation.—Is made in a similar manner to the preceding salt, viz. by first precipitating ferric hydrate and then adding a solution of citric acid until the hydrate is dissolved. To this solution is finally added quinine (precipitated from the sulphate of quinine by solution of ammonia), stirring until the latter is dissolved. The solution is filtered, evaporated, and dried in thin layers, and kept in a stoppered bottle.

Characters and Tests.—Thin scales of a greenish golden-yellow colour, somewhat deliquescent, and entirely soluble in cold water. The solution is very slightly acid, and is precipitated *white* by solution of ammonia, quinina being thrown down. The precipitate is almost entirely soluble in pure ether, showing freedom from quinidina and cinchonina, and when burned leaves but a minute residue. The taste is bitter as well as chalybeate.

It contains both ferrous and ferric salts.

Dose.—5 to 10 grains.

Therapeutics.—Tonic and astringent, combining the properties of iron and quinine. It must not be given with alkalies, since these precipitate the quinine.

Adulterations.—Cinchonine and deficiency of quinine.

FERRUM TARTARATUM. TARTARATED IRON.

Preparation.—Solution of ammonia mixed with water is added to solution of persulphate of iron also diluted with water. The mixture is filtered, and the precipitate (hydrated ferric oxide) is washed until free from sulphate. Acid tartrate of potassium is now mixed intimately with this washed precipitate and allowed to stand, then heated and water added until everything is dissolved. It is lastly filtered and evaporated to a syrup, and dried in thin layers, the dried salt being removed in flakes and kept in a stoppered bottle.

Characters.—Thin transparent scales of a deep garnet colour, slightly sweetish and astringent in taste, soluble in water and sparingly soluble in spirit.

Dose.—5 to 10 grains.

Therapeutics.—Exactly similar in action to the citrate of iron and ammonium.

Vinum Ferri. Wine of Iron. Fine iron wire and sherry (1 ounce to the pint). Probably contains iron in the form of tartrate. Intense olive brown.

Dose.—1 to 4 drachms.

TESTS FOR THE SALTS OF IRON.

Iron salts are known by the protosalts being green, and their solutions giving a dark blue precipitate with *red* prussiate of potassium ; the persalts being foxy red, and their solutions yielding a dark prussian blue precipitate with the *yellow* prussiate of potassium.

CUPRUM. COPPER. Cu = 63·4.

Fine copper wire, about No. 25 wire gauge, or about 0·02 inch.

Used in the preparation of *Cupri Nitras*, *Cupri Sulphas*, and *Spiritus Ætheris Nitrosi* (see page 54).

CUPRI SULPHAS. SULPHATE OF COPPER.
$CuSO_4,5H_2O$.

Preparation.—May be obtained by heating sulphuric acid and copper together, dissolving the soluble product in hot water, and evaporating the solution until crystallisation takes place on cooling. It may also be obtained by dissolving the black oxide of copper in hot diluted sulphuric acid, filtering, evaporating, and crystallising.

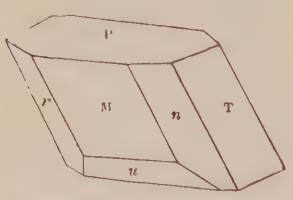


Fig. 86.—Doubly oblique prism of sulphate of copper.

Characters and Tests.—A blue crystalline salt, in doubly oblique prisms (fig. 86), soluble in water, forming a pale blue solution which strongly reddens litmus. The aqueous solution gives with chloride of barium a white precipitate insoluble in hydrochloric acid, and a maroon-red precipitate with yellow prussiate of potassium. If an aqueous solution of the salt be mixed with twice its volume of solution of chlorine, and solution of ammonia be added, the precipitate formed by the first addition of the ammonia will be dissolved

by a further and sufficient addition of the alkali, and a violet-blue solution will be produced, leaving nothing undissolved.

Dose.—As an *astringent*, $\frac{1}{4}$ to 2 grains; as an *emetic*, 5 to 10 grains; *externally*, 1 to 10 grains or more to an ounce of water.

Therapeutics.—Given internally in small doses sulphate of copper acts as an astringent to the alimentary canal, and may be used for obstinate diarrhœa and dysentery; after absorption, it acts as a tonic to the nervous system, and is given in chorea and epilepsy.

In large doses it is a speedy, powerful emetic, and is used in some cases of narcotic poisoning. Externally it may be applied in strong solution, or in the form of a powder, to extensive granulations and ulcers, or in weaker solution to lessen the excessive secretions from mucous membranes in gleet and ophthalmia and prolapsus ani.

Adulterations.—Sulphate of iron may be contained in the commercial salt, and sulphate of zinc is sometimes a fraudulent addition.

Anhydrous Sulphate of Copper ($CuSO_4$). The sulphate deprived of its water by a heat of 400° F. (204°·3 C.). This is a yellowish white powder, becoming blue when moistened with water. It is used as a test for the presence of water in alcohol.

Solution of Ammonio-Sulphate of Copper, sulphate of copper, solution of ammonia, and distilled water. The formula of the contained salt is $CuSO_4,4NH_3,H_2O$.

Merely introduced as a test for the qualitative analysis of liquor ammoniæ fortior.

POTASSIO-CUPRIC TARTRATE SOLUTION.
Commonly known as Fehling's Solution.

Preparation.—No. 1. Sulphate of copper (346·4 grains) is dissolved in distilled water, and the solution is diluted with more distilled water to the volume of 5,000 grain-measures.

No. 2. Caustic soda ($1\frac{3}{4}$ ounce) and tartarated soda (4 ounces) are dissolved in distilled water, and the solution is diluted with more distilled water to 5,000 grain-measures.

When required for use, equal volumes of the solutions No. 1 and No. 2 should be mixed.

Uses.—Employed officially for demonstrating the glucosidal nature of picrotoxin ; it has been extensively used for the detection of grape-sugar in diabetic urine, with which it yields a bright-red precipitate of the suboxide of copper.

Subacetate of Copper of Commerce.—Verdigris (Ærugo), $Cu(C_2H_3O_2)_2,CuO$. A green crystalline salt.

Preparation.—By exposing plates of copper to the action of the fermenting marc of grapes, or pyroligneous acid, the salt forming on the surface.

Use.—This salt is employed as a test for the presence of butyric acid in valerianate of zinc (page 145). It is occasionally applied externally as an escharotic, either in powder, or mixed with vinegar or honey.

CUPRI NITRAS. NITRATE OF COPPER.

$Cu(NO_3)_2,3H_2O$.

Preparation.—May be obtained by dissolving copper in diluted nitric acid and evaporating the solution until crystallisation takes place on cooling to a temperature not lower than 70° F. (21° C.).

Characters and Tests.—Deep blue prismatic crystals, very deliquescent and highly corrosive. With one third of its weight of water, it forms, at a temperature below 70° F., tabular crystals, $Cu(NO_3)_2,6H_2O$. With a very little more water, added directly, or absorbed from the air, it yields a styptic, caustic, corrosive fluid.

Use.—Only employed externally to syphilitic ulcers of the mouth, tongue, and genitals. It excites more healthy alterative action upon the tissues around the ulcer after its destruction than is afforded by the sulphate of copper.

TESTS FOR THE SALTS OF COPPER.

The copper compounds are known by their solutions giving ; with liquor potassæ, a blue precipitate turned black on boiling, and, with solutions of ammonia, a bluish-white precipitate which

is dissolved and forms a beautiful sapphire-blue solution with excess of the ammoniacal solution.

They also give a chocolate precipitate with ferrocyanide of potassium.

HYDRARGYRUM. MERCURY. Hg = 200.

This metal is chiefly obtained from cinnabar, the native sulphide, by distillation with iron.

Characters and Tests.—A metal, fluid at common temperature, brilliantly lustrous, and easily divisible into spherical globules. Volatilises at a temperature below that of visible redness, leaving no residue.

Official Preparations.—Liquid mercury is seldom, f ever, used in medicine, but some of its preparations are valuable from containing mercury in a finely divided condition.

HYDRARGYRUM CUM CRETA, Mercury with Chalk. Mercury and prepared chalk are rubbed together until metallic globules are no longer visible to the naked eye and the mixture acquires a uniform grey colour. = (1 in 3). Light grey.

Dose.—3 to 8 grains.

PILULA HYDRARGYRI, Mercurial Pill or Blue Pill. Mercury is rubbed with confection of roses until metallic globules are no longer visible ; powdered liquorice root is then added, and the whole mixed.

Dose.—3 to 8 grains.

EMPLASTRUM HYDRARGYRI, Mercurial Plaster. Mercury, olive-oil, sublimed sulphur, and lead plaster.

= (about 1 in 3). Blue.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO, Ammoniac and Mercury Plaster. Ammoniacum, mercury, olive-oil, and sublimed sulphur. = (nearly 1 in 5). Brownish lead colour.

UNGUENTUM HYDRARGYRI, Ointment of Mercury ; blue ointment. Mercury, prepared lard, and prepared suet. = (nearly 1 in 2).

UNGUENTUM HYDRARGYRI COMPOSITUM, Compound Ointment of Mercury. Ointment of mercury, yellow wax, olive-oil, and camphor. Lead colour.

Linimentum Hydrargyri, Liniment of Mercury. Mercurial ointment, solution of ammonia, and liniment of camphor. =(1 ointment in 3, or 1 of mercury in 6).

Suppositoria Hydrargyri, Mercurial Suppositories. Ointment of mercury and oil of theobroma. 5 grains of mercurial ointment in each suppository.

Therapeutics of the Mercurial Salts :—

Taken into the stomach in a liquid form, mercury appears to have no action upon the economy ; pounds have been swallowed without any particular results ; occasionally, however, in consequence of partial oxidation and absorption, the full effects of the metal have been developed. In the form of vapour, mercury acts very energetically. When administered in small doses, mercurials increase the various secretions, and thus they are considered to be sialagogue, cholagogue, diuretic, and emmenagogue. They promote the absorption of morbid fluids, increasing the activity of the absorbent system and preventing deposition. In whatever form they are administered, mercurials become absorbed into the blood, and their presence may be detected in milk, saliva, sweat, urine, bile, and pus from ulcers ; also in various tissues, as bone, synovial and serous membranes, brain, lungs, and areolar tissue. When administered internally for any length of time, the red corpuscles of the blood are diminished in quantity, and the anæmic condition is established. Mercurials are employed internally :

In *internal congestions*, as of the liver and kidneys.

In *acute and chronic inflammations*. More useful in inflammation of the serous than of the mucous membranes ; mercurials are positively injurious in scrofulous or erythematous inflammation, and in all inflammatory actions of a low type.

In *dropsies dependent upon inflammation of serous membranes and disease of the liver.*

Mercurials are injurious in chronic diseases of the kidney.

They are very valuable in *syphilis.*

When used externally, in the form of ointment or plaster, the metal becomes absorbed and the system affected generally ; these preparations are used occasionally to introduce the mineral into the system by "inunction.'

The ordinary "grey powder" is one of the mildest forms of employing mercury. It may be used in irritable conditions of the intestines, as diarrhœa, exerting very slight influence upon the mucous membrane. The "blue pill" is comparatively non-irritating.

Effects of over-doses, or excessive action of mercurials:

These are profuse ptyalism, with swelling of the salivary glands and the tongue, swelling and redness of the gums, ulceration of the mucous membrane of the mouth, loosening of the teeth, caries and necrosis of the jaw, violent purging, with bilious stools, the mercurial eczema, inflammation of the bone and periosteum, and *mercurial erethism*, viz.: a low febrile condition characterised by intense prostration, neuralgia, tremor, paralysis, and death. This train of symptoms is usually observed in persons who have been exposed to the action of the vapour of mercury.

Circumstances by which the action of mercurials is modified:

Age; the drug is much better borne by children than by adults. The action of mercurials is resisted by acute inflammation, but in kidney disease, scrofula and scurvy, the constitution is very sensitive to the mineral.

HYDRARGYRI IODIDUM RUBRUM. RED IODIDE OF MERCURY. HgI_2.

Preparation.—Perchloride of mercury (4 ounces) and iodide of potassium (5 ounces) are dissolved, each in distilled water, the former in 3 pints and the latter in 1 pint, and the two solutions are mixed. The precipitate (HgI_2) is collected, washed, and dried.

Characters and Tests.—A crystalline powder of a vermilion colour, becoming yellow when gently heated over a lamp on a sheet of paper; almost insoluble in water; dissolves sparingly in alcohol, but freely in ether, or in an aqueous solution of iodide of potassium.

Dose.—$\frac{1}{32}$ to $\frac{1}{8}$ grain.

Official Preparations.—Used in preparing the Liquor Arsenii et Hydrargyri Iodidi (see page 125), and in the following:

(1) Unguentum Hydrargyri Iodidi Rubri, Ointment

of Red Iodide of Mercury. Red iodide of mercury and simple ointment. = (1 in 28). Scarlet, blackening by exposure to light.

Therapeutics.—Bears a close resemblance to corrosive sublimate. It is chiefly used externally for enlarged glands and for syphilitic and periosteal nodes, and in goitre. Internally, it is employed in the same cases as corrosive sublimate.

HYDRARGYRI OLEATUM. OLEATE OF MERCURY.

Preparation.—By adding gradually yellow oxide of mercury to oleic acid, kept stirred in a mortar, the mass being triturated occasionally until it is all dissolved.

Characters.—A light brown, oleaginous, semi-solid substance composed of oleate of mercury and oleic acid, and having the usual slight smell of oleic acid. Heated with a piece of copper foil, the latter becomes coated with a film of metallic mercury.

Use.—This is a useful application to inflamed parts, joints, and glands in syphilis. It has been stated to be effective in cases of ringworm and pediculi. It should be applied with a brush, or spread lightly over the part with the finger, and covered with linen rag.

HYDRARGYRI OXIDUM FLAVUM. YELLOW OXIDE OF MERCURY. HgO,H_2O.

Preparation.—Perchloride of mercury is dissolved in distilled water, the solution being dried by the application of heat, and then added to solution of soda. The yellow precipitate is allowed to subside. It is then removed, washed, and dried.

Characters and Tests.—A yellow powder. It is entirely volatilised when heated to incipient redness, being resolved into oxygen gas and the vapour of mercury. Differs from the red oxide only in its physical characters.

Therapeutics.—It is used as a local application in chronic inflammation of joints and in skin diseases ; also employed as an inunction in syphilis. It forms the active ingredient in "yellow wash."

HYDRARGYRI OXIDUM RUBRUM. RED OXIDE OF MERCURY. HgO.

Preparations.—Mercury is dissolved in nitric acid diluted with water, and the solution is evaporated to dryness ; with the dry salt (nitrate of mercury) thus obtained, more mercury is triturated until the two are uniformly blended together. The mixture is heated until acid vapours cease to be evolved, and, when cold, the product is enclosed in a bottle.

Characters and Tests.—An orange-red powder. Entirely volatilised by a heat under redness, being at the same time decomposed into mercury and oxygen. Even if this be done in a test tube, no orange vapours are perceived.

Official Preparation.—Unguentum Hydrargyri Oxidi Rubri, Ointment of Red Oxide of Mercury. Red oxide of mercury, in very fine powder, added to hard and soft paraffins melted together. = (1 in 8). Red.

Therapeutics.—This oxide is only used externally. It is applied to the eyes in ophthalmia, and to indolent ulcers in the form of ointment. In powder it is escharotic, and may be used alone, or mixed with sugar, to specks in the cornea, excrescences, chancres, and fungoid ulcers.

Adulterations.—Brick-dust, red lead, and other red powders are sometimes added.

HYDRARGYRI PERCHLORIDUM. PERCHLORIDE OF MERCURY. CORROSIVE SUBLIMATE. $HgCl_2$.

Preparation.—Persulphate of mercury ($HgSO_4$) and chloride of sodium (NaCl) are mixed in fine powder with black oxide of manganese, and the mixture is placed in an apparatus adapted for sublimation, sufficient heat being applied to cause vapours of perchloride of mercury to rise into the less heated part of the apparatus which has been arranged for their condensation. The employment of the black oxide of manganese is to generate with the excess of common salt some free chlorine, by which the formation of calomel is prevented from the subsulphate of mercury, which salt the persulphate of mercury some-

times contains. The sulphate of mercury is prepared by submitting sulphuric acid and mercury to heat in an iron pot, set in brickwork over a proper fire, and under a hood or chimney to carry off the vapour of sulphurous acid (fig. 87, *a*). The mixture of sulphate and common salt is subjected to sublimation in an earthen alembic placed in sand contained in an iron pot, or in an iron pot lined with clay and covered by an inverted earthen pan (fig. 87, *b*). The same pot, with a different head, may be used in the preparation of calomel. The changes which occur are as follows :

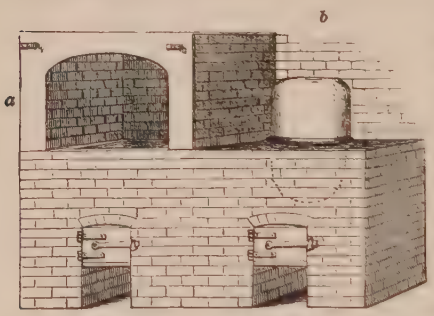


FIG. 87.—Furnaces for the preparation of perchloride of mercury.

a, furnace for the preparation of the persulphate of mercury. When the operation is going on, an iron plate is suspended in front of the hood to prevent the escape of vapour. *b*, furnace for the sublimation of the perchloride.

$$2NaCl + HgSO_4 = Na_2SO_4 + HgCl_2.$$

Sulphate of sodium and perchloride of mercury are formed.

Characters and Tests.—In heavy colourless masses of prismatic crystals (the right rhombic prism, fig. 88), possessing a highly acrid metallic taste ; more soluble in alcohol, and still more so in ether, than in water. If a drop or two of a solution of perchloride of mercury is placed on a piece of gold—as a sovereign—and a key is applied so that it may touch simultaneously the gold and the solution, an electric current is instantly generated, the perchloride is decomposed, and the mercury attaches itself

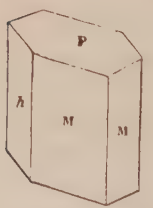


FIG. 88.—Crystal of perchloride of mercury.

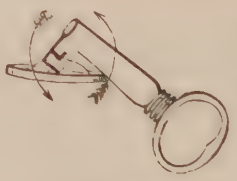


FIG. 89.—Galvanic test for perchloride of mercury.

to the negative electrode (or pole), namely, the gold, while the chlorine combines with the iron of the positive electrode (or pole) to form chloride of iron (fig. 89 ; the arrows point out the direction of the electric current). The stain on the gold is readily removed by heat.

Dose.—$\frac{1}{16}$ to $\frac{1}{8}$ grain.

Official Preparations.—Liquor Hydrargyri Perchloridi, Solution of Perchloride of Mercury. Perchloride of mercury and chloride of ammonium dissolved in distilled water. $\frac{1}{2}$ grain of the mercurial salt to the ounce of the liquor. = (1 in 875). Colourless.

Dose.—$\frac{1}{2}$ fluid drachm to 2 fluid drachms.

Lotio Hydrargyri Flava, Yellow Mercurial Lotion. Perchloride of mercury and solution of lime. 18 grains to 10 fluid ounces. = (1 in 243).

Therapeutics.—A powerful irritant. In very small doses an alterative, useful in chronic affections, syphilitic or otherwise, in the scaly skin affections (squamæ), and in periosteal affections. Externally, it is employed as a lotion, injection, gargle, or ointment, in chronic skin diseases and ulcerated sore throats.

Incompatibles.—Preparations containing albumen or tannin, with which it causes precipitates. It is also thrown down by alkalies, alkaline sulphides, iodides, and tartar emetic.

HYDRARGYRI SUBCHLORIDUM. SUBCHLORIDE OF MERCURY. CALOMEL. HgCl.

Preparation.—Sulphate of mercury, moistened with some water, is rubbed together with mercury until globules are no longer visible, in order to form subsulphate of mercury (Hg_2SO_4). Thus :

$$HgSO_4 + Hg = Hg_2SO_4.$$

Dried chloride of sodium is now added, and the whole thoroughly mixed by continued trituration :

$$Hg_2SO_4 + 2NaCl = Na_2SO_4 + 2HgCl.$$

The salt is now sublimed by a suitable apparatus into a chamber of such size that the calomel, instead of adhering to its side as a crystalline crust, shall fall as a fine powder on its floor. The powder is washed with boiling distilled water until the washings are free from corrosive sublimate, and finally dried and preserved in a jar or bottle impervious to light.

One method (fig. 90) for preparing calomel consists in keeping the receiving vessel filled with steam, so that the vaporous

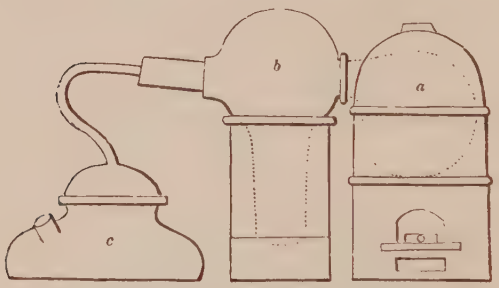


FIG. 90.—Apparatus for preparing calomel by steam

a, furnace, containing an earthen retort (having a wide and short neck) in which the ingredients for making calomel are placed; *b*, an earthen receiver, having three tubulures, one communicating with the retort, a second dipping into water in an earthen jar, and a third connected to a steam pipe; *c*, steam boiler.

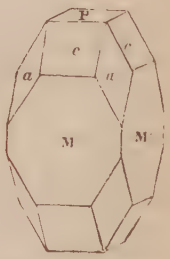


FIG. 91.—Crystal of calomel.

calomel is condensed in it and takes the form of extremely fine powder.

Characters and Tests.—A dull white heavy and nearly tasteless powder, sometimes rendered yellowish by trituration in a mortar; insoluble in water, spirit, or ether. Contact with hydrocyanic acid darkens its colour. It is entirely volatilised by a sufficient heat. Warm ether which has been shaken with it in a bottle leaves, on evaporation, no residue. The crystals of calomel are square prisms (fig. 91).

Dose.—$\frac{1}{2}$ grain to 5 grains.

Official Preparations.—(1) LOTIO HYDRARGYRI NIGRA, Black Mercurial Lotion. Subchloride of mercury and solution of lime. 3 grains to the ounce. = (about 1 in 146).

(2) PILULA HYDRARGYRI SUBCHLORIDI COMPOSITA, Compound Pill of Subchloride of Mercury. Subchloride of mercury,

sulphurated antimony, guaiacum resin in powder, and castor oil. Bright orange.

Dose.—5 to 10 grains.

(3) UNGUENTUM HYDRARGYRI SUBCHLORIDI, Ointment of Subchloride of Mercury. Subchloride of mercury and benzoated lard. = (about 1 in $6\frac{1}{2}$). Cream-coloured.

Therapeutics.—Calomel produces little local irritation; it may be given in some forms of liver disease, and in cases of obstruction to the portal circulation. In children it produces the so-called "calomel-stools," or greenish-coloured fæces. It is said to unload the liver, give relief in biliary secretions, and cause light-coloured motions to become brown.

Dose.—$\frac{1}{2}$ to 5 grains.

Incompatibles.—It must never be given with alkaline carbonates, since there is a possibility of the formation of the perchloride of mercury

Adulterations.—Perchloride of mercury, formed in its preparation, and intentional impurities may be present as sulphate and carbonate of barium.

HYDRARGYRI PERSULPHAS. PERSULPHATE OF MERCURY. $HgSO_4$.

Preparation.—Mercury is heated with sulphuric acid in a porcelain vessel, stirred constantly until the metal disappears, the heat being continued until a dry white salt remains.

Characters.—A white crystalline heavy powder, rendered yellow by affusion of water. Entirely volatilised by heat. This salt is only used for the preparation of calomel and corrosive sublimate; it is never used internally.

HYDRARGYRUM AMMONIATUM. AMMONIATED MERCURY. NH_2HgCl.

Preparation.—Perchloride of mercury is dissolved in distilled water with the aid of heat; the solution is mixed with solution of ammonia, constantly stirring. The precipitate is collected on a filter, and washed until the liquid which passes through is free from chloride. The product is finally dried.

Characters and Tests.—An opaque white powder, on which water has but little and ether and alcohol no action. Digested with caustic potash, it evolves ammonia, acquiring a pale yellow colour.

Official Preparation.—Unguentum Hydrargyri Ammoniati, Ointment of Ammoniated Mercury. (Ammoniated mercury, and simple ointment. = (1 in 10). Cream colour.

Therapeutics.—Never given internally. Used externally, and as a stimulating application to chronic skin affections, and for destroying pediculi and acari. The powder may be used alone or mixed with rose water, and by this means greasing of the linen may be obviated.

Adulterations.—Chalk, carbonate of lead, plaster of Paris, &c.

HYDRARGYRI NITRATIS LIQUOR ACIDUS (HYDRARGYRI NITRAS, Hg_2NO_3). ACID SOLUTION OF NITRATE OF MERCURY.

Preparation.—Really contains mercuric nitrate, the formula for the mercurous nitrate being $HgNO_3$. It is prepared by dissolving mercury in a mixture of nitric acid and water without the application of heat. The mixture is boiled gently for a few minutes in order to expel nitric oxide and ensure the formation of the pernitrate.

Official Preparation.—Unguentum Hydrargyri Nitratis, Ointment of Nitrate of Mercury; citrine ointment. Mercury, nitric acid, prepared lard and olive-oil. = (about 1 in $15\frac{1}{2}$). Lemon colour.

Unguentum Hydrargyri Nitratis Dilutum, Diluted Ointment of Nitrate of Mercury. Nitrate of mercury ointment and soft paraffin. = (1 in 2).

Therapeutics.—This solution is never used internally. It is a powerful caustic used in diluted solution as a gargle (1 or 2 minims in an ounce of water), and as an injection in gonorrhœa (1 minim to 2 ounces of water). The ointment is exceedingly useful in eye affections, as tinea tarsi, and in some skin diseases.

It is applied to syphilitic warts, tubercles, and ulcers.

TESTS FOR THE SALTS OF MERCURY.

The *mercurous* salts are known by giving a black precipitate with lime water, and an olive-green precipitate with iodide of potassium.

The *mercuric* salts give yellow with lime water, and a scarlet precipitate with iodide of potassium which is soluble in excess of either the mercuric salt or the potassic iodide.

ARGENTUM. SILVER. Ag=108.

ARGENTUM PURIFICATUM. REFINED SILVER.

Pure metallic silver.

Test.—If ammonia be added in excess to a solution of the metal in nitric acid, the resulting fluid exhibits neither colour nor turbidity, showing absence of metallic impurities as copper or lead.

It is used for coating pills, and for the preparation of the following :—

ARGENTI NITRAS. NITRATE OF SILVER. LUNAR CAUSTIC. $AgNO_3$.

Preparation.—Nitric acid and distilled water are added to refined silver in a flask, and gentle heat is applied till the metal is dissolved. The solution is evaporated and set aside to crystallise, the crystals being then dried by exposure to the air, carefully avoiding the contact of all organic substances. To obtain the nitrate in rods, the crystals should be fused in a capsule of platinum or thin porcelain, and the melted salt poured into proper moulds. Nitrate of silver must be preserved in bottles carefully stoppered.

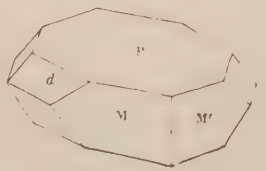


FIG. 92.—Crystal of nitrate of silver.

Characters.—In colourless tabular crystals, the primary form of which is the right rhombic prism (fig. 92); or in white cylindrical rods; soluble in distilled water, and in rectified spirit.

Used in the preparation of *Argenti Oxidum*, and the *Argenti et Potassii Nitras.*

Dose.—$\frac{1}{6}$ to $\frac{1}{3}$ of a grain in the form of a pill.

Incompatibles.—Distilled water must always be used with silver nitrate, since in the natural state water will throw down a white precipitate of the carbonate of silver. Nitrate of silver decomposes all vegetable infusions.

Therapeutics.—Externally this salt is astringent, irritant, and vesicant, and may be applied with great advantage to poisoned wounds and ulcers, venereal or otherwise, pustules and erysipelas, and for the destruction of warts, chancres, and morbid growths. Internally, in small doses, it is astringent, and alterative to the mucous membrane of the stomach and intestines; it also acts as a tonic, and is occasionally administered in cholera, angina pectoris, and chronic gastric affections, diarrhœa, gastrodynia, pyrosis, and vomiting. On the Continent it is highly esteemed for the treatment of epilepsy and chorea; its internal use must, however, not be of long continuance, since it may communicate to the skin a permanent leaden hue, the first indication of which is a dark line round the gums (said to be removed by the steady exhibition of acid tartrate of potassium).

Argenti et Potassii Nitras.—Nitrate of silver and potassium; mitigated caustic. Nitrate of silver (1) and nitrate of potassium (2) are fused and mixed thoroughly in a capsule of platinum or thin porcelain, and the melted mass poured into proper moulds; it is afterwards preserved in bottles carefully stoppered. =(1 in 3). White or greyish-white cylindrical rods or cones.

ARGENTI OXIDUM. OXIDE OF SILVER. Ag_2O.

Preparation.—Nitrate of silver crystals are dissolved in distilled water, and the solution is poured into a bottle containing solution of lime; the mixture is well shaken and set

aside to allow the deposit to settle. The deposit is collected on a filter, washed with distilled water, dried, and kept in a stoppered bottle.

Characters.—An olive-brown powder, which at a low red heat gives off oxygen, and is reduced to the metallic state.

Dose.—$\frac{1}{2}$ to 2 grains in a pill.

Incompatibles.—Oxide of silver decomposes many organic substances; it is especially incompatible with creasote, with which it forms a body liable to spontaneous combustion.

Therapeutics.—This salt is similar in its action to the nitrate, but its topical action is slight. It may be employed as a nervine tonic, and in dyspepsia.

TESTS FOR THE SALTS OF SILVER.

The silver salts are known by giving a white precipitate with hydrochloric acid (chloride of silver) soluble in ammonia, and also a yellow precipitate with tribasic phosphate of sodium (tribasic phosphate of silver).

AURUM. GOLD. Au=196·5.

Fine gold, in mass or leaf, free from metallic impurities.

Solution of Perchloride of Gold.—Is made by the addition of nitric acid and hydrochloric acid, mixed with water, to fine gold (reduced to a thin lamina by a rolling machine), and digested until solution is effected. A small amount of more hydrochloric acid is added to the solution, which is then evaporated, and the resulting gold chloride is dissolved in water. It should be kept in a stoppered bottle.

Used as a test for the alkaloid atropine, with which it produces a citron-yellow precipitate.

PLATINUM. PLATINUM. Pt=195.

Solution of Perchloride of Platinum.—Is obtained by dissolving thin platinum foil in a mixture of nitric and hydrochloric acids dissolved in water.

Used as a test for the salts of potassium, with which it yields a yellow precipitate falling very slowly.

Platinum Black.—Consists of platinum in a state of minute division, and is obtained by adding excess of sodium carbonate and some sugar to solution of perchloride of platinum, and boiling until a black precipitate is formed, which is washed and dried.

VOLUMETRIC SOLUTIONS.

The proportions in which chemical substances combine to form compounds are unvarying and definite.

In *Gravimetric Quantitative Analysis*, quantity is estimated by weight. A body may be separated and weighed by itself, or it may be separated and weighed in combination with another body, of which the combining proportion is known. Thus, in Argenti Nitras, 10 grains of this salt dissolved in 2 fluid drachms of distilled water gives, with hydrochloric acid, a precipitate, which, when washed with hot distilled water and dried thoroughly, weighs 8·44 grains of silver chloride. In this precipitate the chlorine will be to the silver as 35·5 (the combining equivalent of chlorine) to 108, (the combining equivalent of silver); since the molecular weight of chloride of silver is 143·5, and consists of 35·5 of chlorine, and 108 of silver.

The processes of *Volumetric Analysis* are also dependent upon the law of combination in definite fixed equivalents or proportions.

To ascertain the strength of the alkalies, the volumetric solution of Oxalic Acid is employed. The combining equivalent or molecular weight of this acid is 126 —*i.e.* this number equals the sum of the combining equivalents of its constituents, for the oxalic acid crystal is represented by the formula $H_2C_2O_4 2H_2O$ ($H_2=2$, $C_2=12\times2=24$, $O_4=16\times4=64$, $2H_2O=36$), and $2+24+64+36=126$.

In consequence of the divalent character of the radical (C_2O_4) of oxalic acid, and the monivalent nature of the majority of the metals, it is found more convenient to take half the molecular weight of the acid —*i.e.* 63—for experimental

purposes. Thus 63 of oxalic acid will neutralise and combine with 40 of caustic soda (NaHO=23+1+16), or 56 of caustic potash (KHO=39+1+16).

In the volumetric solution of soda, NaHO=40.

Thus the molecular weight of soda is 40, and it will consequently neutralise and combine with acids in equivalent proportions.

For example, 60 parts by weight of true acetic acid, $HC_2H_3O_2$, is a combining proportion, and it will exactly neutralise 40 parts by weight of soda with the formation of acetate of sodium.

For the estimation of chlorine and iodine the volumetric solution of Hyposulphite of Sodium is employed.

To peroxidise the ferrous salts the volumetric solution of Bichromate of Potassium is used.

To ascertain the strength of solution of arsenious acid the volumetric solution of Iodine is employed, and it is also used for the same purpose in the case of sulphurous acid.

For testing the strength of hydrocyanic acid the volumetric solution of Nitrate of Silver is used.

THE VEGETABLE KINGDOM.

CLASS I.—EXOGENÆ.

SUB-CLASS I.—THALAMIFLORÆ.

Aurantiaceæ.

1.—CITRUS VULGARIS: THE SEVILLE OR BITTER ORANGE TREE.

Aurantii Cortex.—BITTER ORANGE PEEL.—The dried outer part of the RIND or pericarp of Citrus Vulgaris (fig. 93). From the ripe fruit imported from the south of Europe, Spain, &c.

FIG. 93.—Citrus vulgaris. The Bitter Orange.

Characters.—In thin pieces or curled bands or strips of a dark orange colour externally, and white internally, a portion of the inner spongy part of the rind not having been removed, possessing a fragrant odour and a bitter aromatic taste. Studded with oil-vesicles; these are convex in the sweet orange and concave in the bitter. Contains a *volatile oil*, a bitter extractive, *Hesperidin*, and a little gallic acid.

Official Preparations.—INFUSUM AURANTII.—Infusion of Orange Peel (bitter orange peel, cut small, and boiling distilled water, infused and strained).

Dose.—1 to 2 fluid ounces.

INFUSUM AURANTII COMPOSITUM.—Compound Infusion of Orange Peel (bitter orange peel, and fresh lemon peel, cut small; cloves, bruised; boiling distilled water).

Dose.—1 to 2 fluid ounces.

Tinctura Aurantii.—Tincture of Orange Peel (bitter orange peel, cut small and bruised, and proof spirit). Contained in *Mistura Ferri Aromatica*, *Syrupus Aurantii*, and *Tinctura Quininæ*.

Dose.—1 to 2 fluid drachms.

Syrupus Aurantii.—Syrup of Orange Peel (tincture of orange peel, and syrup). Contained in *Confectio Sulphuris*.

Dose.—1 fluid drachm.

Vinum Aurantii.—Orange Wine (a wine produced in Britain by the addition of the fresh peel of the bitter orange to a fermented saccharine solution). Contains about 12 per cent. of alcohol, and is a vinous liquid, of a golden sherry colour, with orange aroma and taste. Used in the preparation of *Vinum Ferri Citratis* and *Vinum Quininæ*.

Bitter Orange Peel also forms an ingredient of the *Infusum Gentianæ Compositum*, the *Tinctura Cinchonæ Composita*, and the *Tinctura Gentianæ Composita*.

Aurantii Floris Aqua.—Orange-Flower Water.—The distilled water of the flowers of the bitter orange, Citrus vulgaris, and also of the sweet orange, Citrus Aurantium (fig. 94). Colourless, or slightly greenish-yellow. Possesses the odour of orange-blossoms, and contains a volatile oil (*Oil of Neroli*), but not similar to that contained in the cortex.

Fig. 94. Citrus Aurantium. The Sweet Orange.

Official Preparation.—Syrupus Aurantii Floris.—Syrup of Orange-Flower (orange-flower water ; refined sugar ; distilled water).

Dose.—1 fluid drachm.

Aurantii Fructus.—The Orange Fruit (the bitter orange).—The ripe fruit of the Citrus Vulgaris. Imported from the south of Europe.

Characters.—Globular except at the two ends, at which it is compressed. About the size of the sweet orange, but the pericarp is rougher and darker in colour, being deep orange-red or red, the pulp very sour and bitter, and the rind more aromatic and very bitter.

Official Preparation.—Tinctura Aurantii Recentis.—Tincture of Fresh Orange Peel (the coloured part of the rind of the bitter orange in thin slices, macerated in rectified spirit).

Dose.—1 to 2 fluid drachms.

Therapeutics.—The rind is a bitter stomachic tonic ; it is useful as an adjunct in the treatment of dyspepsia ; and by it the taste of quinine is somewhat masked. The syrup of orange and orange-flower water are employed only as flavouring agents.

Adulterations.—Orange-flower water is liable to become impregnated with lead, acquired from the vessels in which it is imported ; a dark stain is then produced in it upon the addition of sulphuretted hydrogen.

2.—ÆGLE MARMELOS. THE BAEL TREE.

Belæ Fructus.—Bael Fruit.—The dried half-ripe fruit of Ægle Marmelos (fig. 95). From Malabar and Coromandel.

Fig. 95.—Ægle Marmelos. The Bael Tree.

Characters.—The fruit is roundish, about the size of a large orange, with a hard, nearly smooth woody rind. It is usually imported in dried, somewhat twisted slices, or in fragments which consist of portions of rind with adherent dried pulp and seeds. Rind covered by pale brown, greyish adherent epicarp. The pulp is orange-brown or cherry colour externally ; when broken, nearly colourless internally. No odour ; taste simply mucilaginous and very slightly acid.

Bael contains an astringent principle somewhat allied to tannic acid.

Official Preparation.—EXTRACTUM BELÆ LIQUIDUM.—Liquid Extract of Bael (bael fruit; distilled water; and rectified spirit).

Dose.—1 to 2 fluid drachms.

Therapeutics.—This drug is held in repute in India for the treatment of dysentery and diarrhœa. It is probably not superior to some other vegetable astringents. From the *ripe* fruit a pulp has been obtained which, when made into a jelly, exerts a mild purgative effect.

3.—CITRUS LIMONUM. THE LEMON TREE.

Limonis Cortex.—LEMON PEEL.—The outer part of the RIND or pericarp of the fresh fruit of Citrus Limonum (fig. 96). Lemons are imported from southern Europe.

Characters. — Pale-yellow slices containing glands with volatile oil. Odour strong, fragrant. Taste warm and bitter. The rind contains a pale-yellow *volatile oil*, tasting and smelling of the peel, a bitter *extractive*, and a little *gallic acid*; also a principle crystallising in fine white needles (*Hesperidin*).

FIG. 96.—Citrus Limonum. The Lemon Tree.

Official Preparations.—SYRUPUS LIMONIS.—Syrup of Lemons (fresh lemon peel; lemon juice, strained; refined sugar).

Dose.—1 fluid drachm. Contained in the *Liquor Magnesii Citratis.*

TINCTURA LIMONIS.—Tincture of Lemon Peel (fresh lemon peel, cut small; proof spirit).

Dose.—½ to 2 fluid drachms.

Lemon peel is also contained in the *Infusum Aurantii Compositum* and *Infusum Gentianæ Compositum.*

Limonis Oleum.—Oil of Lemon.—A volatile oil obtained by mechanical means from fresh lemon peel. It consists of two isomeric oils composed of $C_{10}H_{16}$. Imported chiefly from Sicily.

Contained in the *Linimentum Potassii Iodidi cum Sapone*, and in *Spiritus Ammoniæ Aromaticus*.

Limonis Succus.—Lemon Juice.—The freshly expressed juice of the ripe fruit of Citrus Limonum.

Characters.—A yellowish, slightly turbid liquor, having a sharp acid taste. Contains citric acid and mucilage, together with small quantities of acid salts, especially those of potassium; also malic acid and sugar. Contains 36 to 46 grains of citric acid in 1 fluid ounce. Used in preparing *Syrupus Limonis*.

Therapeutics.—Lemon peel is an aromatic stomachic. The volatile oil is carminative and stimulant when given *internally*; when applied *externally*, it is rubefacient.

Fig. 97. Citrus medica. The Citron.

Lemon juice is refrigerant, and may be employed instead of, and in preference to, citric acid in the preparation of effervescing draughts; it is also anti-scorbutic (citric acid is not). Lemon juice combined with bicarbonate of potassium has been successfully employed in the treatment of acute rheumatism.

Adulterations.—Oil of turpentine; unless in large quantities this is difficult of detection. Lime juice is often mixed with lemon juice. A mixture of sugar and water combined with diluted sulphuric acid has been substituted for lemon juice.

Fig. 97 shows the Citrus medica, or citron, the properties of which are analogous to the orange and lemon.

Byttneriaceæ.

THEOBROMA CACAO. CACAO BUTTER.

Theobromatis Oleum.—Oil of Theobroma.—A concrete oil, obtained by expression and heat from the ground seeds of Theobroma Cacao (fig. 98). The tree grows in South America and the West Indies.

Fig. 98.—Theobroma Cacao. The Cocoa or Chocolate Tree.

Characters.—Of the consistency of tallow; colour yellowish, with an odour resembling chocolate. Taste bland and agreeable. Does not turn rancid upon exposure to air, and breaks with a clean fracture. Insoluble in water, soluble in ether, alcohol, and oil of turpentine.

Contains mostly *Stearin* with a little *Olein*, forming about 52 per cent. of good shelled cacao beans.

Use.—Oil of Theobroma is employed only in the formation of suppositories, namely, of tannic acid, mercury, iodoform, morphine, and lead (compound suppository).

The seeds (nuclei cacao) when torrefied and with various additions (sugar, and generally either vanilla or cinnamon) made into a paste constitute *chocolate*.

Cocoa is said to be made from the fragments of the seed-coats mixed with portions of the kernels.

Camelliaceæ.

CAMELLIA THEA. THE TEA PLANT.

Caffeina.—Theina-Guaranina, $C_8H_{10}N_4O_2,H_2O$.

An alkaloid obtained usually from the dried leaves of Camellia Thea, or the dried seeds of Coffea arabica (fig. 99) (natural order Cinchonaceæ), by evaporating aqueous infusions from which astringent and colouring matters have been removed. A species of Camellia (the Japonica) is shown in fig. 100.

Characters and Tests. — Colourless, inodorous, silky, acicular crystals. Soluble in 80 parts of cold water. Heated with a crystal of potassium chlorate, and a little hydrochloric

FIG. 99.—Coffea arabica. The Coffee Plant.

FIG. 100. Camellia japonica.

acid, the mixture being then evaporated to dryness, a reddish residue results, which upon being moistened with ammonia becomes purple. In an aqueous solution of the alkaloid, tannic acid gives a white precipitate soluble in excess of the reagent. Caffeine is also present in guarana, and in maté or Paraguay tea, the leaves of the Ilex paraguayensis. It is allied to theobromine, the active principle found in Theobroma Cacao.

Caffeine readily dissolves in the salicylates, and may be prescribed conveniently with salicylate of sodium.

Dose.—1 to 5 grains in solution or in pills combined with glycerine and tragacanth. Caffeina is used in preparing

Caffeinæ Citras. —Citrate of Caffeine, $C_8H_{10}N_4O_2HC_6H_5O_7$, a weak compound of caffeine and citric acid.

Preparation.—By dissolving citric acid in distilled water and stirring caffeine into the heated solution. It is then evaporated to dryness in a water-bath, being stirred constantly to the end of the operation and then reduced to a fine powder.

Characters and Tests.—A white inodorous powder, with an acid and faintly bitter taste, and an acid reaction. Is decomposed, upon the addition of water, into caffeine and citric acid, the caffeine first precipitating, and becoming redissolved upon adding more water.

Dose.—2 to 10 grains.

Therapeutics of caffeine and its citrate.—In medicinal doses these substances stimulate the respiratory and cardiac centres, increasing the pulse-rate and the rise of blood pressure. They produce a marked stimulating and tonic effect upon the heart-muscle, rendering its contractions slower and stronger, and these, if irregular, become firm and steady. Irregular action of the heart may, however, be produced by large doses, the action of which resembles digitalis. Caffeine is a diuretic, often acting speedily, and it may be given in somewhat large doses in those cases of cardiac dropsy in which digitalis fails. It may be advantageously exhibited in chronic Morbus Brightii, the urine being increased in quantity, and the albumen and anasarca diminished.

Caffeine is also serviceable in headache and neuralgia. It has, however, this disadvantage, that custom destroys its efficacy.

It should be given in repeated small doses, since it is liable to produce nausea and vomiting.

Canellaceæ.

CANELLA ALBA. THE LAUREL-LEAVED CANELLA.

Canellæ Cortex.—CANELLA BARK.—The BARK of Canella alba (fig. 101), deprived of its corky layer and dried. Obtained from the West Indies.

FIG. 101.—Canella alba. The White Canella.

Characters.—In quills or irregular broken pieces, of a pale orange-brown or buff colour, externally somewhat paler, being whitish or yellowish-white internally. Has a pungent, bitter, acrid taste, and an odour somewhat like a mixture of cinnamon and cloves. It contains a *resin*, with some *volatile oil*, bitter *extractive*, *mannite sugar*, and *starch*; but no gallic or tannic acids.

Dose, of the powdered bark.—15 to 30 grains.

Therapeutics.—Canella acts as an aromatic tonic and bitter stomachic. It has been given in dyspepsia, but is rarely employed except in combination, as in the Vinum Rhei.

Cruciferæ or Brassicaceæ.

1.—COCHLEARIA ARMORACIA. HORSERADISH.

Armoraciæ Radix.—Horseradish Root.—The fresh root of Cochlearia Armoracia (fig. 102). From plants cultivated in

Fig. 102.—Cochlearia Armoracia. The Horse-radish.

a, the flower and leaf; *b*, the root.

Fig. 103.—A Siliqua.

Britain; most active in the autumn and early spring, before the appearance of the leaves.

Characters.—Nearly cylindrical, except at the upper end, which is conical and enlarged, and marked in an annulated manner by the scars of fallen leaves; about half an inch to an inch in diameter, and usually a foot or more in length. Externally, pale yellowish-white or brownish-white; internally, whitish and fleshy. When scraped it emits a pungent odour

and has an acrid taste, due to the presence of a *volatile* oil, which is identical with the oil of mustard.

Official Preparations.—SPIRITUS ARMORACIÆ COMPOSITUS. —Compound Spirit of Horseradish (horseradish root, scraped ; bitter orange peel, cut small and bruised ; nutmeg, bruised ; proof spirit, and water ; mixed and distilled at a moderate heat).

Dose.—1 to 2 fluid drachms.

Therapeutics.—As a rule it is only used as a condiment ; the compound spirit, however, has been employed in dyspepsia, in acute rheumatism, and in dropsies.

The fruit of the Cruciferæ is a Siliqua (silique), which is shown in fig. 103.

2.—SINAPIS: BRASSICA NIGRA ET BRASSICA ALBA. BLACK AND WHITE MUSTARD.

Sinapis.—The SEEDS of black and white mustard (fig. 104) powdered and mixed. Obtained from plants cultivated in Britain.

The black seeds are scarcely half the size of the white. Both are finely pitted and hard, and internally yellow ; taste very pungent. The black seeds are externally dark reddish or greyish-brown, emitting a strong pungent odour, affecting the eyes when triturated with water, whilst the white are pale yellow.

Characters and Test of the Powder.—Greenish-yellow, with a bitterish, oily, pungent, acrid taste, scentless when dry, but when moistened exhaling a peculiar pungent penetrating odour, highly irritating to the eyes and nostrils. Should contain no starch.

FIG. 104.

a, Brassica alba (White Mustard) ; *b*, Brassica nigra (Black Mustard).

Both the seeds contain a fixed oil ; in the black variety is

contained *Myronic Acid* in combination with potassium, as myronate of potassium, which, by the action of *Myrosine* (an albuminous substance also residing in the seeds) breaks up, in the presence of water, into glucose, hydropotassic sulphate, volatile oil of mustard, and some free sulphur.

The *volatile oil* of mustard is very acrid and pungent, and has the composition and properties of allyl sulphocyanide (C_3H_5CNS). It produces almost immediate vesication when applied to the skin. This oil is not yielded by the white mustard, in which variety a crystallisable compound (*Sulphosinapisin*) is contained, and which gives rise to a non-volatile acrid principle containing sulphur.

The *fixed oil* of mustard contains *Erucic Acid*.

Official Preparations.—Cataplasma Sinapis.—Mustard Poultice (mustard, in powder; linseed meal; boiling water, and lukewarm water).

Charta Sinapis.—Mustard Paper (mustard, in powder, is mixed with solution of gutta-percha, so as to form a semi fluid mixture, strips of cartridge paper being passed over its surface, so as to coat thinly one side of the paper, which is then dried). Should be dipped in tepid water before application.

Sinapis Oleum.—Oil of Mustard.—The oil distilled with water from the seeds of the Black Mustard after the expression of the fixed oil.

Official Preparation.—Linimentum Sinapis Compositum.—Compound Liniment of Mustard (ethereal extract of mezereon and camphor are dissolved in rectified spirit, oil of mustard and castor oil being subsequently added).

Therapeutics.—Powerfully stimulant. Internally, in large doses, mustard induces speedy vomiting, and is very useful in narcotic poisoning. In smaller doses it assists digestion. Externally in the form of a poultice it is powerfully counter-irritant and rubefacient, and may be employed for the relief of many inflammations of serous and mucous membranes, as in pleurisy and bronchitis, or to alleviate neuralgia and other pains and spasms.

The oleum sinapis (the volatile oil) is a very valuable local application.

Adulterations.—Common flour, chilies, turmeric and pepper are extensively added to mustard.

Erythroxylaceæ.

ERYTHROXYLON COCA. CUCA.

Coca.—The dried LEAVES of Erythroxylon Coca, native of South America.

Characters.—Shortly stalked, oval or lanceolate, varying in thickness, one or two inches or more in length, entire, generally blunt and emarginate, perfectly smooth ; the midrib prominent, having numerous faint lateral veins which freely anastomose, and on each side of the midrib a curved line extending from base to apex ; green above, somewhat paler beneath. Commercial specimens present more or less broken leaves, which are often yellowish-green, yellowish-brown, or brown, and in rare cases the curved lines are indistinguishable. The odour is faintly tea-like, especially when bruised ; the taste somewhat bitter and aromatic. Contains an alkaloid, *cocaine*, combined with a variety of tannic acid.

Dose.—½ to 2 drachms. Used in preparing the following.

Official Preparation.—COCÆ EXTRACTUM LIQUIDUM. Liquid Extract of Coca (coca in No. 40 powder, and proof spirit ; prepared by maceration, percolation, and evaporation to a soft consistence).

Dose.—½ to 2 drachms.

Cocainæ Hydrochloras.—Hydrochlorate of Cocaine, $C_{17}H_{21}NO_4,HCl$. May be prepared by agitating with ether an aqueous solution of an acidulated alcoholic extract of coca, rendered alkaline by sodium carbonate ; separating and evaporating the ethereal liquid, purifying the product by repeating the treatment with acidulated water, sodium carbonate, and ether ; decolorising ; neutralising with hydrochloric acid and recrystallising.

Characters and Tests.—In nearly colourless acicular crystals or crystalline powder, readily soluble in water. The aqueous

solution has a bitter taste. It gives a yellow precipitate with chloride of gold, and a white precipitate with ammonium carbonate soluble in excess.

When heated with strong hydrochloric acid it is resolved into a new alkaloid (ecgonine) together with methyl alcohol and benzoic acid.

In cold concentrated acid it dissolves without colour, but it chars with hot sulphuric acid.

It burns without residue when ignited in the air.

Dose.—$\frac{1}{6}$ to 1 grain.

Official Preparation.—Lamellæ Cocainæ. Discs of Cocaine. Discs of gelatine, with some glycerine, each weighing about $\frac{1}{30}$th grain, and containing $\frac{1}{200}$th grain of hydrochlorate of cocaine. They are intended to be applied to the conjunctiva in order to produce local anæsthesia.

Liquor Cocainæ Hydrochloratis.—Solution of Hydrochlorate of Cocaine. To boiling distilled water salicylic acid ($\frac{1}{2}$ gr.) is added, and lastly hydrochlorate of cocaine ($\frac{3}{3}$ gr.). The mixture is allowed to cool, and water is added if necessary to produce the required volume, viz., 6 fluid drachms.

Boric acid is frequently preferred to salicylic acid in the preparation of this solution, especially when employed in ophthalmic surgery. The fact of merely boiling the water, unless precautions are taken for the prevention of contact with unfiltered air after boiling, will be of little avail against the formation of fungoid growth.

Dose.—2 to 10 minims.

Therapeutics of Coca and Cocaine.—The coca leaves when chewed are stated to exert a powerfully restorative, stimulant, and possibly narcotic influence.

Cocaine is said to raise the temperature, to accelerate the pulse, and increase the frequency of the respirations; the blood first rises and then falls under its internal administration. The hydrochlorate of cocaine possesses powerful local anæsthetic properties. Its solution produces upon the tongue a tingling sensation, which is followed by numbness. When applied to the eye it produces rapid and complete insensibility of the conjunctiva, succeeded by dilatation of the pupil with loss of

accommodation; its effects being apparently due to stimulation of the peripheral ends of the sympathetic nerves.

Local anæsthesia may be produced by applying to mucous surfaces strong solutions, viz. 20 per cent., or injecting hypodermically a 4 per cent. solution, and thus this substance is of great value in arresting pain during ophthalmic and minor operations.

Coca in the form of wine is frequently given, and has been found to give increased power to the nervous system in old persons.

Guttiferæ.

GARCINIA HANBURII.

Cambogia.—Gamboge.—A gum-resin obtained from Garcinia Hanburii (fig. 105). Imported from Siam.

Dose.—1 to 4 grains.

Characters.—In cylindrical solid or hollow rolls, striated longitudinally on the surface, by the impression of the bamboo reeds in which the juice is collected, ½ inch to 1½ inch in diameter; breaks with a conchoidal fracture. The fractured surface is smooth, glistening, and reddish-yellow, turning yellow when it is rubbed with water; taste very acrid. Should not contain starch. Consists of about 70 per cent. of a resin, *Gambogic Acid*, with about 25 per cent. of a soluble gum.

Fig. 105.—Garcinia Hanburii. The Gamboge Plant.

A, male flowering branch; 1, back view of a flower; 2, side view of the same, showing numerous stamens. B, fruit-bearing branch; 3, section of fruit with its four seeds.

Dose of the powder, 1 to 4 grains.

Official Preparation.—Pilula Cambogiæ Composita.—Compound Pill of Gamboge (gamboge, Barbadoes aloes, and hard soap (all in powder), compound powder of cinnamon, and syrup).

Dose.—5 to 10 grains.

Therapeutics.—Gamboge is a drastic hydragogue cathartic, frequently causing vomiting and griping. It is seldom given alone, being usually combined with some vegetable purgative, or with calomel or cream of tartar. It may also be employed as an anthelmintic. It should always be given with ginger or some aromatic oil. In regard to its purgative effects, it may be placed between scammony and croton oil or elaterium.

Adulterants.—Sometimes adulterated with starch, an emulsion of which with boiling water will become green upon the addition of iodine (the blue from the iodide of starch and the yellow from the gamboge being then blended).

Linaceæ.

LINUM USITATISSIMUM COMMON LINSEED OR FLAX.

Lini Semina.—Linseed.—The dried ripe seeds of Linum usitatissimum. Cultivated in Britain.

Characters.—Small, pointed, about one-sixth to one-fourth of an inch, somewhat flattened, ovoid, and obliquely pointed, externally brown, smooth, shining, internally yellowish-white, odourless, but with a mucilaginous oily taste. The kernel of the seeds contains a fixed oil; the testa or envelope, a mucilage. *Palmitin* and perhaps *Stearin* are contained in the fixed oil, together with a glyceride of linoleic acid.

Official Preparation.—Infusum Lini.—Infusion of Linseed (linseed, dried liquorice root in powder, and boiling distilled water). The seeds are not crushed, since the covering contains the mucilage.

Dose.—Ad libitum.

Lini Farina.—Linseed Meal.—The cake of linseed from which the oil has been pressed, reduced to powder.

Official Preparation.—Cataplasma Lini.—Linseed poultice (linseed meal, mixed gradually with boiling water, stirring constantly). Linseed meal is also contained in *Cataplasmata Carbonis, Creasoti, Sinapis, and Sodæ Chloratæ.*

Lini Oleum.—Linseed Oil.—The oil expressed in Britain without heat from linseed.

Characters.—Viscid, yellow, with a faint odour and bland oleaginous taste. By exposure to air it gradually thickens.

Therapeutics.—Administered *internally*, in the form of the infusion, linseed is demulcent, and is often given in urinary and catarrhal affections; in dysentery and diarrhœa. *Externally*, in the form of the poultice, it is applied to inflamed or suppurating parts. The oil is a useful application to scalds or burns, either alone or mixed with lime-water.

Magnoliaceæ.

ILLICIUM ANISATUM. THE STAR ANISE.

Anisi Stellati Fructus.—Star Anise Fruit. The dried fruit of Illicium anisatum. From plants cultivated in China.

Characters.—Usually composed of eight fully developed carpels diverging horizontally in a stellate manner from a short

Fig. 106.—Magnolia glauca.

central axis, each carpel boat-shaped, beaked, rusty brown, wrinkled, and containing a reddish-brown seed; odour and taste resembling anise fruit.

From this fruit an Oil is obtained which very closely resembles the true oil of anise. It is used in preparing the Anisi Oleum.

One of the plants belonging to Magnoliaceæ (the Magnolia glauca) is shown in fig. 106.

Malvaceæ.

GOSSYPIUM BARBADENSE. COTTON WOOL.

The HAIRS of the SEED of Gossypium barbadense (fig. 107), and of other species of Gossypium (Gossypium herbaceum, fig. 108, and the like), fatty matters and all impurities having been removed; carded.

Characters.—In white soft filaments, each consisting of an elongated tubular cell; when examined under a microscope

FIG. 107.—Gossypium barbadense.

FIG. 108.—Gossypium herbaceum.

appearing as a flattened twisted band, its edges slightly thickened. Tasteless and inodorous. Resembles cellulose ($C_{12}H_{20}O_{10}$) in composition.

Official Preparations.—PYROXYLIN.—Gun Cotton (cotton wool, sulphuric acid, nitric acid; readily soluble in a mixture of ether and rectified spirit). It is used for preparing

COLLODIUM.—Collodion (pyroxylin, ether, rectified spirit).

COLLODIUM VESICANS. — Blistering Collodion (pyroxylin and blistering liquid).

COLLODIUM FLEXILE. — Flexible Collodion (collodion, Canada balsam, castor oil).

Uses.—When applied to the skin, collodion, on the evaporation of its ether, leaves a transparent film, and may be applied to inflamed or cut surfaces; it may be applied in such skin diseases as smallpox, and to chapped nipples, or to arrest the hæmorrhage from leech-bites.

Flexible collodion does not crack, and is therefore for surgical purposes more serviceable than the other form.

Menispermaceæ.

1.—ANAMIRTA PANICULATA—COCCULUS INDICUS.

Picrotoxinum.—Picrotoxin.—This substance is obtainable from the seeds of the Anamirta paniculata (fig. 109), or Cocculus indicus, a climbing shrub (growing in the East India Islands and Malabar coast), by exhaustion with alcohol, evaporation, and purification. Imported from the United States.

Fig. 109.—Anamirta paniculata.

Characters and Tests.—Colourless and inodorous prismatic crystals, possessing a bitter taste. It melts at 378° Fahr. (192°·2 C.) It is soluble in three hundred and thirty parts of cold water, leaving only a trace of residue, in thirty-five parts of boiling water, also in three of boiling and thirteen of cold rectified spirit. It is soluble in ten parts of solution of potash, and the resulting liquid, on boiling, immediately reduces Fehling's solution. Heated on platinum foil, the crystals melt, forming a yellowish liquid, which, by further heating, chars, and is at length completely dissipated. Its aqueous solution is not precipitated by solutions of perchloride of mercury, perchloride of platinum, or tannic acid. It dissolves in sulphuric acid with a saffron-yellow colour.

Dose.—$\frac{1}{100}$ to $\frac{1}{30}$ grain.

Therapeutics.—Picrotoxin acts upon the nervous system as an intoxicating agent, and apparently upon the cerebellum. It has been employed successfully in epilepsy and in pharyngeal paralysis, also in the night-sweats of phthisis. It does not, like atropine or belladonna, produce dryness of the throat or other unpleasant effect. It has also been used in periodical sick headaches, both by the mouth and hypodermically. An ointment (10 grains to the ounce) is used in the treatment of parasitic diseases of the skin.

An antagonism is said to exist between picrotoxin and chloral hydrate, one-twentieth of a grain sufficing for thirty grains of chloral; and picrotoxin is said to be antidotal to morphine and chloroform asphyxia.

2.—JATEORHIZA CALUMBA.

Calumbæ Radix.—CALUMBA ROOT. — The dried transversely cut slices of the ROOT of Jateorhiza Calumba (fig. 110). From the forests of Eastern Africa, between Ibo and the Zambesi.

FIG. 110.—Jateorhiza Calumba (male plant).

Dose, in powder.—5 to 20 grains or more.

Characters.—Irregular slices, flat, oval or circular, about an inch to two inches in diameter, and half an inch in thickness. Cortical portion, softer and thinner towards the centre, greyish or greenish-yellow, bitter. Calumba root contains a non-nitrogenised crystallisable neutral principle termed *Columbine*, and an *Acid* termed *Calumbic*, together with an alkaloid, *Berberine*, in the form of calumate of berberine. The root also contains a large quantity of starch.

Official Preparations.—EXTRACTUM CALUMBÆ. — Extract of Calumba (calumba root, cut small, and proof spirit; evaporated to a certain consistency). Prepared by maceration.

Dose.—2 to 10 grains.

INFUSUM CALUMBÆ.—Infusion of Calumba (calumba root, cut small, and *cold* distilled water).

Dose.—1 to 2 fluid ounces.

TINCTURA CALUMBÆ.—Tincture of Calumba (calumba root, cut small, proof spirit). Prepared by maceration and percolation.

Dose.—$\frac{1}{2}$ to 2 fluid drachms.

Calumba root is also contained in *Mistura Ferri Aromatica*.

Therapeutics.—Calumba is a bitter tonic and stomachic.

Incompatibles.—It contains no tannic or gallic acid, and is therefore compatible with the salts of iron. The cold infusion contains no starch in solution, so that no blue colour is developed upon the addition of iodine.

3.—CHONDRODENDRON TOMENTOSUM. THE VELVET LEAF.

Pareiræ Radix.—PAREIRA ROOT.—The dried ROOT of Chondrodendron tomentosum (fig. 111). From Brazil.

Characters.—Long, nearly cylindrical, twisted pieces, some two inches thick. The bark is thin, blackish-brown, marked with longitudinal furrows and transverse ridges. The interior is yellowish or brownish grey, with well-marked concentric circles of porous wood with medullary rays. When cut, presents a waxy appearance. No odour; taste bitter.

FIG. 111.—Chondrodendron tomentosum. The Velvet Leaf.

It contains a nitrogenised crystalline principle, *Pelosine* or *Cissampeline*, together with resin, starch, salts, and a yellow bitter matter.

Dose, in powder.—30 to 60 grains.

Official Preparations.—DECOCTUM PAREIRÆ. Decoction of Pareira (pareira root in No. 20 powder and distilled water; boiled and strained).

Dose.—1 to 2 fluid ounces.

EXTRACTUM PAREIRÆ.—Extract of Pareira (pareira root, in No. 40 powder; boiling distilled water). Prepared by digestion, percolation, and evaporation of the liquid to a proper consistence for forming pills.

Dose.—10 to 30 grains.

EXTRACTUM PAREIRÆ LIQUIDUM. — Liquid Extract of Pareira (extract of pareira, dissolved in a mixture of distilled water and rectified spirit).

Dose.—½ fluid drachm to 2 fluid drachms.

Therapeutics.—A bitter tonic, like calumba. It is supposed to exert a specific action upon the mucous membrane of the

bladder, and to act as a diuretic. Chiefly employed in chronic catarrhal affections of the bladder, to diminish mucous discharge, and to allay irritation.

Papaveraceæ.

1.—PAPAVER SOMNIFERUM. THE WHITE, GARDEN, OR OPIUM POPPY.

Opium.—Opium. Turkey Opium. The juice obtained in Asia Minor by incision from the unripe capsules of Papaver somniferum (figs. 112, 113), inspissated by spontaneous evaporation.

Characters.—In irregular lumps, usually weighing from about 8 ounces to 2 pounds; enveloped generally in portions of poppy-leaves, and scattered over with the reddish-brown chaffy fruits of a species of Rumex. When fresh, plastic, internally somewhat moist, and reddish or chestnut-brown,

Fig. 112.—Capsule of the Opium Poppy.

Fig. 113.—Papaver somniferum. The White Poppy.

becoming harder by keeping, and darkening to blackish-brown. Odour, strong, peculiar, narcotic; taste, nauseously bitter. Should yield as nearly as practicable 10 per cent. of morphine.

Dose.—$\frac{1}{2}$ grain to 3 grains.

Important crystalline principles contained in opium are the following:

Meconic Acid ($H_3C_7HO_7$), sparingly soluble in water;

forms insoluble salts with lead, barium, and calcium. It yields a *blood-red* colour with the neutral solution of perchloride of iron.

Thebolactic Acid ($C_3H_6O_3$), isomeric with lactic acid.

Morphine ($C_{17}H_{19}NO_3$), an alkaloid in the form of 6-sided prisms. Very slightly soluble in ether or water, but soluble in alcohol. When dry it gives a *yellow* colour, passing into *orange-red* with strong nitric acid. It liberates iodine, and thus renders starch blue when it is added to iodic acid. Morphine and its salts, in solution, give a *greenish-blue* colour with perchloride of iron.

Papaverina ($C_{21}H_{21}NO_4$), an alkaloid in small colourless prisms.

Paramorphine or Thebaine ($C_{19}H_{21}NO_3$), an alkaloid which crystallises in square silvery plates.

Narcotine ($C_{21}H_{23}NO_7$), in brilliant prisms. When heated with water splits up into *cotarnine* ($C_{11}H_{10}(CH_3)NO_3$) and *meconine* ($C_8H_4(CH_3)_2O_4$).

Narceine ($C_{23}H_{20}NO_9$), dissolved by sulphurous acid. The solution is rich amber, but rapidly passes through greenish-orange to port-wine hue.

Opianyl or Meconine ($C_{10}H_{10}O_4$), in colourless hexagonal prisms.

Porphyroxine, a crystalline principle, becoming purple when heated with diluted hydrochloric acid.

In addition to the above substances, several different *resins* are contained in opium, together with gummy, extractive and fatty matters, caoutchouc, a trace of *volatile oil*, and inorganic salts.

Official Preparations of Opium.

Confectio Opii.—Confection of Opium (compound powder of opium, mixed with syrup). 1 part of opium in 40, nearly.

Dose.—5 to 20 grains.

Emplastrum Opii.—Opium Plaster (opium, in the finest powder, and resin plaster). 1 part in 10.

Enema Opii.—Enema of Opium (tincture of opium, $\frac{1}{2}$ fluid drachm; mucilage of starch, 2 fluid ounces).

Extractum Opii.—Extract of Opium (opium, in powder; distilled water). About 1 part from 2.

Dose.—½ grain to 2 grains.

Used in preparing *Extractum Opii Liquidum*, *Trochisci Opii*, and *Vinum Opii*.

Extractum Opii Liquidum.—Liquid Extract of Opium (extract of opium ; distilled water ; rectified spirit). 22 grains of the extract in 1 fluid ounce, nearly.

Dose.—10 to 40 minims.

Linimentum Opii.—Liniment of Opium (tincture of opium, liniment of soap). 1 volume tincture in 2 volumes.

Pilula Ipecacuanhæ cum Scillâ . .	1 part in 23, nearly.
„ Plumbi cum Opio	1 part in 8.
„ Saponis Composita	1 part in 6, nearly.
Pulvis Cretæ Aromaticus cum Opio	1 part in 40.
„ Ipecacuanhæ Compositus . .	1 part in 10.
„ Kino Compositus	1 part in 20.

Pulvis Opii Compositus.—Compound Powder of Opium (opium, black pepper, ginger, caraway fruit ; tragacanth, all in powder). 1 part in 10.

Dose.—2 to 5 grains.

Suppositoria Plumbi Composita. 1 grain of opium in each suppository.

Tinctura Camphoræ Composita. 2 grains of opium to 1 fluid ounce.

Tinctura Opii.—Tincture of Opium (opium, in powder ; proof spirit). 33 grains to 1 fluid ounce, nearly.

Dose.—5 to 40 minims.

Used in preparing the *Enema* and *Linimentum opii*.

Tinctura Opii Ammoniata.—Ammoniated Tincture of Opium (opium in powder ; saffron, cut small ; benzoic acid ; oil of anise ; strong solution of ammonia ; rectified spirit).

5 grains to 1 fluid ounce.

Dose.—½ to 1 fluid drachm.

Trochisci Opii.—Opium Lozenges (extract of opium, tincture of tolu ; refined sugar and gum acacia, in powder ; extract of liquorice ; distilled water). $\frac{1}{10}$ grain of extract in each lozenge.

Dose.—1 to 6 lozenges.

Unguentum Gallæ cum Opio. 32 grains of opium to 1 ounce.

Vinum Opii.—Wine of Opium (extract of opium ; cinnamon bark, bruised ; cloves, bruised ; sherry). 22 grains extract in 1 fluid ounce, nearly.

Dose.—10 to 40 minims.

Morphinæ Acetas.—Acetate of Morphine ($C_{17}H_{19}NO_3$, $HC_2H_3O_2$,$3H_2O$) (hydrochlorate of morphine ; solution of ammonia, acetic acid, and distilled water ; chloride of ammonium is formed, the acetic acid uniting with the morphine).

Dose.—$\frac{1}{8}$ to $\frac{1}{2}$ grain.

The *Official Preparation* of this salt is

Liquor Morphinæ Acetatis.—Solution of Acetate of Morphine (acetate of morphine ; diluted acetic acid ; rectified spirit ; distilled water). About 1 in 100.

Dose.—10 to 60 minims.

Morphinæ Hydrochloras.—Hydrochlorate of Morphine ($C_{17}H_{19}NO_3$,HCl,$3H_2O$) (opium, sliced ; chloride of calcium ; purified animal charcoal ; diluted hydrochloric acid ; solution of ammonia and distilled water).

Watery solution of opium contains the meconate and lactate of morphine and codeine ; to this solution is added a strong solution of chloride of calcium ; thus meconate and lactate of calcium in company with some resins are precipitated, the chlorine uniting with the morphine and codeine. The whole is evaporated until it forms a solid mass when cool, and is then enveloped in calico and subjected to strong pressure in order to remove the mother liquor, in which much colouring matter is present. Boiling water is now added to the cake to dissolve the hydrochlorate of codeine and morphine, the solution being then filtered and washed ; it is again evaporated, and the pressed cake dissolved in boiling water with purified animal charcoal, to get rid of all colouring matter, and, after filtration, slight excess of ammonia is added, which precipitates the morphine, and leaves the codeine in solution. The pure crystalline morphine which separates is dissolved in hydrochloric acid, and the hydrochlorate of morphine allowed to crystallise.

Dose.—$\frac{1}{8}$ to $\frac{1}{2}$ grain.

The *Official Preparations* of this salt are

Injectio Morphinæ Hypodermica.—Hypodermic Injection of Morphine (hydrochlorate of morphine ; solution of ammonia, acetic acid, distilled water).

Contains 1 grain of acetate of morphine in 10 minims of the injection.

Dose, by subcutaneous injection.—1 minim to 5 minims.

Liquor Morphinæ Hydrochloratis.—Solution of Hydrochlorate of Morphine (hydrochlorate of morphine ; diluted hydrochloric acid ; rectified spirit ; distilled water). About 1 in 100.

Dose.—10 to 60 minims.

Suppositoria Morphinæ.—Morphine Suppositories (hydrochlorate of morphine ; oil of theobroma).

$\frac{1}{2}$ grain of hydrochlorate of morphine in each suppository.

Suppositoria Morphinæ cum Sapone.—Morphine Suppositories with Soap (hydrochlorate of morphine ; glycerine of starch ; curd soap, in powder ; starch, in powder).

$\frac{1}{2}$ grain of the morphine salt in each suppository

Trochisci Morphinæ.—Morphine Lozenges (hydrochlorate of morphine ; tincture of tolu ; refined sugar, in powder ; gum acacia, in powder ; mucilage of gum acacia ; distilled water). $\frac{1}{36}$ gr. of hydrochlorate of morphine in each lozenge.

Dose.—1 to 6 lozenges.

Trochisci Morphinæ et Ipecacuanhæ.—Morphine and Ipecacuanha Lozenges (hydrochlorate of morphine ; ipecacuanha, in fine powder ; tincture of tolu ; refined sugar, in powder ; gum acacia, in powder ; mucilage of gum acacia ; distilled water). $\frac{1}{36}$ grain of the morphine salt and $\frac{1}{12}$ grain of ipecacuanha are contained in each lozenge.

Dose.—1 to 6 lozenges.

Tinctura Chloroformi et Morphinæ. See Chloroform, page 56.

Morphinæ Sulphas.—Sulphate of Morphine, $(C_{17}H_{19}NO_3)_2$, $H_2SO_4,5H_2O$. This salt is prepared in a similar manner to the hydrochlorate of morphine, sulphuric acid being added at the end of the process instead of hydrochloric acid.

Characters and Tests.—Colourless, silky, acicular crystals ; soluble in twenty-four parts of water.

Dose.—$\frac{1}{8}$ to $\frac{1}{2}$ grain.

Liquor Morphinæ Sulphatis.—Solution of Sulphate of Morphine.

Official Preparation.—Sulphate of morphine (35 grains) is dissolved in distilled water ; rectified spirit (2 fluid ounces) is added, and finally also distilled water to the amount of 8 fluid ounces.

Dose.—10 to 60 minims.

Therapeutics.—Similar to the acetate and hydrochlorate of morphine.

Apomorphinæ Hydrochloras.—Hydrochlorate of Apomorphine, $C_{17}H_{17}NO_2$,HCl. This is the hydrochlorate of an alkaloid, obtained by heating morphine or codeine in sealed tubes with hydrochloric acid.

Characters and Tests.—Small greyish-white, shining acicular crystals, which turn green on exposure to light and air. Soluble in seven parts of water. From solutions, bicarbonate of sodium throws down a precipitate which becomes green on standing, and then forms a purple solution with ether, violet with chloroform, and bluish-green with alcohol. Used in preparing the following :—

Apomorphinæ Injectio Hypodermica.—Hypodermic Injection of Apomorphine. Hydrochlorate of apomorphine is dissolved in camphor water and filtered (2 grains in 100 minims). The solution should be made as required for use.

Dose.—Expectorant, by the mouth, $\frac{1}{2}$ grain in mixture ; *emetic*, by mouth, $\frac{1}{3}$ grain ; *hypodermically*, $\frac{1}{6}$ grain.

Therapeutics.—Possesses none of the narcotic effects of morphine. Whether given by the mouth or hypodermically, it produces vomiting. Its action is rapid, and not succeeded by nausea and prostration. A most valuable and efficacious remedy in cases of poisoning ; also serviceable as an expectorant.

Acidum Meconicum.—Meconic acid, $H_3C_7HO_7$.

Characters and Tests.—Occurs in micaceous crystals, almost colourless, readily soluble in alcohol, but sparingly so in water. Its watery solution has a strongly acid taste and reaction, and

is coloured red by neutral solution of ferric chloride, the colour being discharged by strong but not by diluted hydrochloric acid; it should give no precipitate with solution of iodine and iodide of potassium, showing absence of alkaloids. It is used in making the following preparation.

MORPHINÆ BIMECONATIS LIQUOR.—Solution of Bimeconate of Morphine. Prepared by dissolving hydrochlorate of morphine in water by the aid of heat, then adding solution of ammonia to precipitate the morphine, filtering and washing the morphine until free from chloride, draining, adding rectified spirit and meconic acid. This solution is colourless, or nearly so. One fluid ounce of it contains about $5\frac{1}{2}$ grains, equal to about $1\frac{1}{4}$ per cent. of bimeconate of morphine, $C_{17}H_{19}NO_3,C_7H_4O_7$.

Dose.—5 to 40 minims.

Therapeutics.—This liquor is stated to occasion less derangement of the stomach and bowels, and less disturbance of the head, than other salts of morphine, either given by the mouth or by hypodermic injection.

Codeina.—Codeine, $C_{18}H_{21}NO_3,H_2O$. This alkaloid is separated from the ammoniacal liquors (from which morphine has been obtained) by evaporating, treating the residue with water, precipitating with caustic potash, and purifying the precipitated codeine by recrystallisation from ether.

Characters and Tests.—In octahedral crystals, colourless or nearly so, soluble in eighty parts of water and of solution of ammonia. Its aqueous solution has a bitter taste and an alkaline reaction. It dissolves in sulphuric acid, forming a colourless solution, which upon gently warming with molybdate of ammonium, or a trace of perchloride of iron, becomes of a deep blue colour. With strong nitric acid it becomes yellow, but not red. From $\frac{1}{4}$ to 1 per cent. of codeine is contained in opium.

Therapeutics.—Possesses feeble narcotic powers. It has proved useful in lessening the cough of phthisis, and reducing the amount of sugar in the urine in cases of glycosuria, when dependent upon some peripheral irritation of the pneumogastric nerve. It has also been administered in sleeplessness, caused by pain in some peripheral region, and in cases of nausea. Its

hypnotic effect is often destroyed by its becoming converted into methyl-codeine.

Therapeutics of Opium and the Morphine Salts.

Opium, taken internally in small doses, at first increases the rapidity and fulness of the pulse, producing very pleasant sensations and exaltation of the mental functions. In about half an hour a feeling of drowsiness follows, and lastly sound sleep, usually accompanied by perspirations. On awakening, headache and nausea, loss of appetite, a furred tongue, thirst and constipation are often complained of. The soporific effect is soon produced if the dose be of tolerable amount, and the patient unaccustomed to the drug. There is intense sleepiness, and difficulty in awakening the patient. When the dose has been very large, poisonous symptoms may set in, the sleep passes into coma and stupor, the respiration becomes slower, the pulse feeble, and the pupils contracted ; cold sweats appear, and death follows.

Upon the *Brain* and *Nervous System* the influence is very marked, as seen in the exaltation of the mental faculties, sleep, stupor, and contracted pupils.

Upon the *Digestive Organs:* there is impairment of digestion, with thirst and constipation, and diminution of the secretions from the whole mucous membrane.

Upon the *Cutaneous System:* free perspiration results, which is much increased when the drug is combined with camphor, ipecacuanha, &c.

Upon the *Vascular System:* first a stimulant and then a sedative effect is produced.

Upon the *Respiratory Organs* a sedative effect is produced, as is observed in the diminution of the respirations and the eventually impaired oxidation of the blood.

Upon the *Excreting* and *Secreting Organs*—with the exception of that of the skin and breasts, the activity of these organs is diminished ; from the diminution of the bile, pale-coloured fæces are produced ; the salivary and buccal mucus and the urine often become scanty.

Upon the *Sexual System* a stimulating effect is produced,

especially in males; in Eastern countries opium has been employed as an aphrodisiac.

Applied to the skin, pain may be alleviated. If the cutis be denuded, the constitutional effects of the drug are produced through absorption. When opium is applied to the mucous membrane of the rectum, either as enema or suppository, the general and local effects are produced. When the salts of morphine are injected hypodermically, pain and spasm are equally relieved, no matter if the application be next the seat of the disease or at a distance; the effect is solely produced through the blood. When opium or morphine is applied to the conjunctiva, contraction of the pupil does *not* occur.

Opium may be exhibited for relieving *spasm* and *pain* in almost every condition of the system; in neuralgia and colic, in tetanus, or during the passage of renal or biliary calculi.

Opium may be combined with calomel in cases of inflammation, in which it is of value since it prevents the mercurial from running away by the bowels. In affections of the air-passages the drug must be administered very cautiously. It is very serviceable when the intestinal canal is implicated, as in dysentery, in which it diminishes irritability, and arrests the secretions.

In *Urinary Diseases*, opium is advantageously employed for diminishing the amount of urine, as in diabetes, and for the relief of irritability of the bladder.

In *Mucous Discharges*, especially in *diarrhœa*, it is extremely valuable.

Opium must be cautiously used in pulmonary affections. It often relieves the cough, but if considerable impairment of the respiratory functions is present, it may produce dyspnœa.

Opium may be used in the form of a suppository or as an enema in painful *Diseases of the Bladder and Rectum*, and in *Chordee*.

Children are far more susceptible to the action of opium than adults, and very much more so than in proportion to the age. In administering opium to infants and very young children, the greatest caution must be observed.

Some persons are peculiarly susceptible to opium, and not infrequently much restlessness and excitement are caused in place of calm sleep.

The presence of disease frequently presents resisting power to the action of opiates, especially when there is much pain.

The most notable effect upon the action of opium, however, is habit or custom. If the dose is increased gradually, large quantities may be taken without any particular results ensuing. 60 grains of Smyrna opium night and morning, and often an ounce to an ounce and a half of laudanum in addition during the day, have been recorded as taken; and one patient stated that he had taken 72 grains of acetate of morphine in one day, and had also swallowed a pint of laudanum.

When the drug has been discontinued for some time, and a large dose is resumed, poisonous effects may occur.

The Salts of Morphine possess the soporific and anodyne powers of opium, but have less tendency to produce headache and nausea, and their action is less stimulant.

Morphine possesses about 4 times the strength of opium.

Adulterations of Opium.—Opium often contains mechanical impurities, as clay, sand, bullets, stones, &c.; it also may be mixed with vegetable extracts of various kinds, treacle and sugar, or it may contain much water, or a good deal of its active matter may have been extracted by water and afterwards dried.

East Indian opium should yield from 3 to 8 per cent. or more of morphine; Egyptian opium about 6 to 7 per cent., and Smyrna opium 10 per cent. of morphine.

Papaveris Capsulæ.—Poppy Capsules.—The nearly ripe, dried capsules of Papaver Somniferum, the garden or opium poppy; cultivated in Britain, growing native in Syria and Egypt.

Characters.—Rounded, somewhat oblong, suddenly contracted below into a neck, crowned above by the stellately arranged stigmas. Yellowish or yellowish-brown externally, and containing white, slaty-coloured, or nearly black seeds. The capsules contain, in addition to woody fibre, a small amount of the principles present in opium.

The seeds, termed maw seeds, possess no narcotic proper-

ties, but contain a bland oil, the poppy oil. More opium is present in the capsules when these are gathered unripe.

Official Preparations.—DECOCTUM PAPAVERIS.—Decoction of Poppy (poppy capsules, bruised; distilled water. Boiled and strained). Only used externally.

EXTRACTUM PAPAVERIS.—Extract of Poppy (poppy capsules, freed from the seeds and in No. 20 powder; rectified spirit; boiling distilled water). Prepared by maceration, percolation, and subsequent evaporation.

Dose.—2 to 5 grains.

SYRUPUS PAPAVERIS.—Syrup of Poppy (poppy capsules, dried, freed from the seeds and reduced to No. 20 powder; rectified spirit; refined sugar; boiling distilled water). Prepared by maceration, evaporation, and straining.

This syrup is sometimes manufactured from treacle and laudanum.

Dose.—1 fluid drachm.

Therapeutics.—The preparations of the poppy capsules act similarly to those of opium, but their action is much weaker and more uncertain. The decoction is only used as an external application to allay pain; the syrup is useful for the relief of cough, and as an opiate for children, but it should be employed with much caution.

2.—PAPAVER RHŒAS. THE RED, OR CORN POPPY.

Rhœados Petala.—RED POPPY PETALS.—The fresh PETALS of Papaver Rhœas (fig. 114). From indigenous plants.

FIG. 114.—Papaver Rhœas. The Red Poppy.

Characters. Of a bright scarlet colour, often nearly black at the base, unequal in size, having a strong narcotic odour and slightly bitter taste. They yield to water a red colouring matter, and contain an alkaloid, *Rhœadine*, with traces of the constituents of opium, but no trace of morphine.

Official Preparation.—SYRUPUS RHŒADOS.—Syrup of Red Poppy (fresh red poppy petals added to

distilled water, the liquor being heated and strained, refined sugar added, and dissolved by heat ; when nearly cold, rectified spirit is added and more distilled water.

Dose.—1 fluid drachm.

Therapeutics.—The action of the red poppy is very mild, but resembles that of opium. It is usually employed only as a colouring agent.

Polygalaceæ.

1.—KRAMERIA TRIANDRA. RHATANY.

Krameriæ Radix.—RHATANY ROOT.—The dried ROOT of (1) Peruvian Rhatany, Krameria Triandra, or of (2) Savanilla Rhatany, Krameria Ixina. Imported from Peru. Grows in New Granada and Brazil.

Characters.—The Peruvian Rhatany is in branched or unbranched pieces. The bark is dark reddish-brown externally, and bright brownish-red on its inner surface. It has a hard brownish, or reddish-yellow woody axis. The Savanilla is less irregular and knotty than the Peruvian, and not so long or so thick ; its colour is dark purplish or violet, and the bark is thicker.

The bark of both kinds has a strong astringent taste, and tinges the saliva red when chewed. No marked odour. Contains *Krameric Acid*, tannin, and a red astringent matter.

Dose, in powder.—20 to 60 grains.

Official Preparations.—EXTRACTUM KRAMERIÆ.—Extract of Rhatany (rhatany root, in No. 40 powder ; distilled water). Prepared by maceration, percolation, and subsequent evaporation.

Dose.—5 to 20 grains.

INFUSUM KRAMERIÆ.—Infusion of Rhatany (rhatany root, in No. 40 powder ; boiling distilled water).

Dose.—1 to 2 fluid ounces.

TINCTURA KRAMERIÆ. — Tincture of Rhatany (rhatany root, in No. 40 powder ; proof spirit). Prepared by maceration and percolation.

Dose.—$\frac{1}{2}$ to 2 fluid drachms.

Rhatany root, in powder, is also contained in the *Pulvis Catechu Compositus.*

Therapeutics.—A powerful astringent. May be given whenever tannin is indicated. It is used in all hæmorrhages and in chronic diarrhœa and dysentery. The diluted tincture or infusion is useful in sore throat, leucorrhœa, and prolapsus ani. The powder is used as a dentifrice when the gums are spongy or bleeding.

2.—POLYGALA SENEGA.

Senegæ Radix.—Senega Root.—The dried root of Polygala Senega (fig. 115). United States of America.

Characters.—The upper end enlarged into an irregular knotty tuberosity bearing the remains of numerous small stems, tapering below in a twisted, curved, usually keeled root, from $\frac{1}{5}$ to more than $\frac{1}{3}$ inch thick. Bark, yellowish or brownish-grey, cracked transversely, horny, and translucent, enclosing a whitish woody column. Odour of bark peculiar, rancid, and its taste at first sweetish, afterwards very acrid, sourish, inducing salivation; wood tasteless and inodorous. Contains a glucoside, *Senegin* or *Polygalic Acid*, which breaks up when boiled with diluted acids into glucose and a substance termed Sapogenin. Tannin, pectin, and gum are also contained in the root.

Fig. 115.—Polygala Senega.

Dose, in powder.—20 to 60 grains.

Official Preparations.—Infusum Senegæ.—Infusion of Senega (senega root, in No. 20 powder; boiling distilled water).

Dose.—1 to 2 fluid ounces.

Tinctura Senegæ.—Tincture of Senega (senega root, in No. 40 powder; proof spirit). Prepared by maceration and percolation.

Dose.—$\frac{1}{2}$ to 2 fluid drachms.

Therapeutics.—Senega acts as a stimulant to mucous membrane, especially that of the bronchial tubes; it is diaphoretic and sometimes diuretic: may be employed in chronic pneumonia and chronic bronchitis. It is occasionally useful in dysmenorrhœa. It may be combined advantageously with

carbonate of ammonium and other expectorants and diaphoretics.

Adulterations.—Ginseng or the root of Panax Quinquefolium and also Gillenia. In these the line (running along the true senega root) is absent.

Ranunculaceæ.

1.—ACONITUM NAPELLUS. ACONITE. THE MONKSHOOD.

Aconiti Folia.—ACONITE LEAVES.—The fresh LEAVES and flowering tops of Aconitum Napellus (fig. 116), gathered,

FIG. 116.—Aconitum Napellus. The Monkshood.

when about one-third of the flowers are expanded, from plants cultivated in Britain.

Characters.—Leaves smooth, deep green on the upper surface, lighter beneath, palmate, and five-partite, the segment wedge-shaped, and pinnately cut, exciting slowly, when chewed, a sensation of tingling and numbness. Flowers large, irregular, deep-blue, in a somewhat loose terminal raceme.

Official Preparation.—EXTRACTUM ACONITI.—Extract of Aconite (the fresh leaves and flowering tops of aconite, bruised,

and the juice treated as in the usual manner for all the green extracts).

Dose.—$\frac{1}{4}$ to 1 grain.

Aconiti Radix.—ACONITE ROOT.—The dried ROOT of Aconitum Napellus, collected in the winter or early spring, before the leaves have appeared, from plants cultivated in Britain and carefully dried ; or imported in a dried state from Germany.

Characters.—Usually from two to three inches long, not thicker than the finger at the crown, fusiform like a carrot, dark-brown ; internally whitish. A minute portion, cautiously chewed, causes prolonged numbness and tingling.

Official Preparations.—LINIMENTUM ACONITI.—Liniment of Aconite (aconite root, in No. 40 powder, camphor and rectified spirit).

TINCTURA ACONITI.—Tincture of Aconite (aconite root, from plants cultivated in Britain, in No. 40 powder, rectified spirit). Prepared by maceration and percolation.

Dose.—5 to 15 minims.

Aconitina.—ACONITINE ($C_{30}H_{47}NO_7$).—An alkaloid obtained from aconite (aconite root, in coarse powder, rectified spirit, distilled water, solution of ammonia, pure ether, and diluted sulphuric acid). Aconite root contains *Aconitate of Aconitine* with resinous matters. By means of the rectified spirit, these substances are extracted from the root ; upon the addition of water the alkaloidal salt is separated from the resinous matter. Solution of ammonia is now added, *Aconitate of Ammonium* being formed and *aconitine* precipitated, the latter being then dissolved in ether, and subsequently recovered by distillation. Sulphuric acid is then added to form sulphate of aconitine, which is afterwards decomposed by solution of ammonia, sulphate of ammonium remaining in solution and *Aconitine* being precipitated. The alkaloid so obtained is dissolved in water and finally dried between folds of blotting-paper.

Characters.—A white amorphous solid soluble in water, very soluble in alcohol and ether, and a very active poison, which, when rubbed on the skin, produces a sensation of tingling, with prolonged numbness.

Aconitine is contained in all parts of the aconite plant, combined with *Aconitic Acid*; a base termed *Aconella* is also present, which does not possess the active properties of aconitine.

Official Preparation.—UNGUENTUM ACONITINÆ.—Ointment of Aconitine (aconitine, rectified spirit, benzoated lard). 8 grains to the ounce.

Therapeutics.—When given internally in small doses aconite produces numbness and tingling of the lips. It has been employed in the treatment of rheumatism, gout, neuralgia, and other painful maladies, in affections of the heart and in dropsies. It appears to cause contraction of the pupil, and acts as a sedative to the heart. It has been strongly recommended as a substitute for depletory measures in the treatment of acute inflammations.

Adulterations.—Aconitine is frequently impure. It may be mixed with delphinine, or may contain aconella. $\frac{1}{50}$ of a grain of pure aconitine will destroy a dog, whereas 1 grain of the spurious alkaloid has often produced very little effect.

2.—CIMICIFUGA RACEMOSA. THE BLACK SNAKE ROOT.

Cimicifugæ Rhizoma.—CIMICIFUGA RHIZOME.—The dried RHIZOME and rootlets of Cimicifuga Racemosa (fig. 117). From North America. Indigenous in the United States and in Canada.

FIG. 117.—Cimicifuga Racemosa. Black Snake Root.

Characters.—The rhizome from two to sixinches in length, half an inch to an inch thick, cylindrical and somewhat flattened, having, above, the remains of several aerial stems, and, below, small, wiry, brittle, branched rootlets. Both rhizome and rootlets are brownish-black, almost without odour, and the taste is slightly acrid and bitter. Fracture short, the rootlets exhibiting a thick bark and a triangular stellate arrangement of woody tissue. Contain when fresh a *volatile oil*, a *resin*, a *bitter neutral substance*, and *tannin*.

Official Preparations.—EXTRACTUM CIMICIFUGÆ LIQUIDUM.—Liquid Extract of Cimicifuga (cimicifuga, in No. 60 powder, and rectified spirit). Prepared by percolation and evaporation to a certain quantity.

Dose.—3 to 30 minims.

TINCTURA CIMICIFUGÆ.—Tincture of Cimicifuga (cimicifuga, in No. 40 powder, and proof spirit).

Dose.—15 to 60 minims.

Therapeutics.—Cimicifuga is given in rheumatism and in chorea; also as a stimulating expectorant in bronchitis, phthisis, and acute catarrh. Small doses act as a tonic upon the heart similarly to digitalis, but larger doses produce a like action to aconite and hellebore upon that organ. It acts upon the uterus almost as powerfully as ergot. Large doses may produce vomiting, tremors, and vertigo, the frequency of the pulse being notably diminished.

3.—HYDRASTIS CANADENSIS. THE GOLDEN SEAL.

Hydrastis Rhizoma.—HYDRASTIS RHIZOME.—This drug is known as the "Golden Seal," and consists of the dried RHIZOME and rootlets of Hydrastis Canadensis (fig. 118). From the United States of America.

FIG. 118. Hydrastis Canadensis. The Golden Seal.

Characters.—The rhizome is simple or branched, from half an inch to an inch and a half long, and from one-eighth of an inch to half an inch in thickness. It is twisted and knotted, and has an irregular appearance. The upper surface has irregular projections, which are terminated by scars produced by the decay of aerial stems. From the lower surface and sides numerous rootlets are given off. The rhizome is yellowish-brown, becoming darker by age. It has a clean resinous fracture of a brownish-yellow colour with a bright yellow centre.

Official Preparations.—Extractum Hydrastis Liquidum. Liquid Extract of Hydrastis. Hydrastis rhizome, in No. 60 powder and diluted rectified spirit. Prepared by maceration and percolation and subsequent evaporation to a soft extract.

Dose.—5 to 30 minims.

Tinctura Hydrastis.—Tincture of Hydrastis.—Hydrastis rhizome, in No. 60 powder (2 ounces), is moistened with a suitable quantity of the menstruum, and macerated for twenty-four hours ; it is then packed in a percolator, and proof-spirit gradually added until one pint of tincture is obtained.

Dose.—20 minims to 1 fluid drachm.

Therapeutics.—Hydrastis possesses tonic stomachic properties. It is used in fevers, intermittent and continued ; it excites uterine contractions. Injected hypodermically the drug has been found to produce uterine action, and induce abortion without danger to the mother. The tincture is employed in gastric catarrh resulting from chronic alcoholism, and is considered to be about the best substitute for the stimulant when this has been abandoned. Hydrastis is useful in atonic dyspepsia, in habitual constipation dependent upon inaction of the liver, and in general debility ; its action in the last-named condition resembling that of quinine. It has also been used as an injection in gonorrhœa (2 drachms to 1 pint of water), and as a lotion it has been applied to cracks and fissures of the nipple, and in chronic inflammation of the mucous membrane. Internally, it has been given in uterine hæmorrhages, for the relief of painful and profuse menstruation, and for fibroid tumours. Its local use has been very successful in chronic pharyngitis.

4.—PODOPHYLLUM PELTATUM. THE AMERICAN MAY APPLE.

Podophylli Rhizoma.—Podophyllum Rhizome.—The dried rhizome and rootlets of Podophyllum Peltatum (fig. 119). Imported from the United States of America.

Characters.—In pieces of variable length, from about $\frac{1}{5}$ to $\frac{1}{3}$ inch thick, cylindrical, flattened, with irregular tuberosities,

marked by a depressed circular scar below, having brownish rootlets, dark reddish-brown externally, whitish within, breaking with a short fracture. Powder yellowish-grey, sweetish in odour, bitterish and nauseous in taste. It is stated to contain an active principle termed *Berberine*.

Fig. 119.—Podophyllum Peltatum.

Dose in powder.—10 to 20 grains.

Podophylli Resina.—Resin of Podophyllum (podophyllum rhizome in No. 40 powder, percolated with rectified spirit, the spirit distilled, and the remaining liquid poured into distilled water, the deposited resin being washed and dried).

Dose.—$\frac{1}{4}$ to 1 grain.

Characters.—An amorphous powder, varying in colour from pale-yellow to deep orange-brown.

Tinctura Podophylli.—Tincture of Podophyllum (resin of podophyllum and rectified spirit). Contains 1 grain of the resin in 1 fluid drachm.

Dose.—15 minims to 1 fluid drachm.

Therapeutics.—Podophyllum root is not much employed. The resin, podophylline, acts as a drastic purgative. It frequently causes emptying of the gall-bladder, but it is questionable if it increases the secretion of bile. It often causes griping, and should always be combined with hyoscyamus, belladonna, or cannabis indica. It is much employed in congestion of the portal system, and may be given in dropsies combined with calomel and acid tartrate of potassium.

5.—DELPHINIUM STAPHISAGRIA. THE STAVESACRE.

Staphisagriæ Semina.—The dried ripe seeds of Delphinium Staphisagria. Chiefly inhabits the southern parts of Europe.

Characters.—Irregularly triangular or obscurely quadrangular, arched, blackish-brown when fresh, but upon keeping becoming dull greyish-brown. Testa deeply wrinkled and pitted; nucleus oily, soft, and whitish. Taste nauseously

bitter and acrid ; no marked odour. Contains two alkaloids, *staphisagrina* and *delphinina*, together with fatty matter, resin, lignin, and wax.

Dose.—3 to 10 grains in powder ; very rarely used internally.

Official Preparation.—Unguentum Staphisagriæ.—Ointment of stavesacre. (Stavesacre seeds crushed and macerated in benzoated lard, and kept melted for a few hours. The mixture is then strained and allowed to cool). Contains about 10 per cent. of the oil of stavesacre.

Therapeutics.—Staphisagrina is a powerful respiratory poison, paralysing the motor nerves in a similar manner to curare. The action of delphinina resembles that of aconitina; when applied over painful cutaneous nerves it causes tingling and numbness, relieving the pain ; in poisonous doses it causes slowness of the pulse and the respiration, paralyses the spinal cord, and death results from asphyxia. It is stated to arrest the convulsions produced by strychnine, by depressing the action of the spinal cord.

Stavesacre is chiefly used externally in the form of the ointment for destroying pediculi, for which purpose it is one of the most valuable applications.

Rutaceæ.

1.—BAROSMA : BETULINA, CRENULATA, AND SERRATIFOLIA.

Buchu Folia.—Buchu Leaves.—The dried leaves of the above three varieties of Barosma (fig. 120). Imported from the Cape of Good Hope.

Characters.—Smooth, marked with pellucid dots (oil glands) on the margins, and especially on their under surface ; colour, dull yellowish-green, odour strong and peculiar, taste aromatic and mint-like. The leaves of *Barosma Betulina* are from half to three quarters of an inch in length, cuneate or rhomboid-obovate, serrate-dentate, the apex very blunt and generally recurved. Their texture is more cartilaginous than in the other species. The leaves of *Crenulata* are from three quarters to about

an inch and a half long, thickish, oval-oblong, or rhomboid-oval, somewhat blunt at the apex, narrowed at the base into a distinct petiole, finely serrate or crenate-serrate. The leaves of the *Serratifolia* are from an inch to an inch and a half in length, linear-lanceolate, equally tapering at each end, actual apex truncate, three-nerved, sharply and finely serrated ; the texture thinner than in the other species. They all contain a *volatile oil*, which

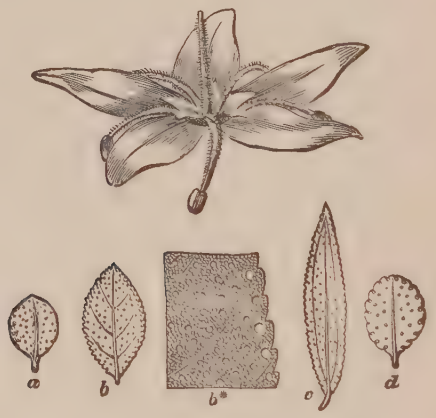


FIG. 120.—Leaves of various species of Buchu.

a, Barosma Graveolens ; *b*, Barosma Crenulata ; *b**, a magnified view of a portion of it ; *c*, Barosma Serratifolia ; *d*, Barosma Venusta.

gives the odour to the leaves, and a bitter extractive matter, *Barosmin* or *Diosmin*.

Official Preparations.—INFUSUM BUCHU.—Infusion of Buchu (buchu leaves, bruised ; boiling distilled water).

Dose.—1 to 4 fluid ounces.

TINCTURA BUCHU.—Tincture of Buchu (buchu leaves, in No. 20 powder ; proof spirit).

Dose.—1 to 2 fluid drachms.

Therapeutics.—Buchu is apparently a slight stomachic and tonic ; it is, however, used chiefly for its action on the urinary organs, as in chronic catarrh of the bladder ; it acts also as a diuretic, and is sometimes diaphoretic.

2.—GALIPEA CUSPARIA. THE ANGUSTURA BARK TREE.

Cuspariæ Cortex.—Cusparia Bark.—The dried bark of Galipea Cusparia. From tropical South America. One of the varieties of Galipea, the Trifoliata, is shown in fig. 121.

Fig. 121.—Galipea Trifoliata.

Characters.—In flattish or curved pieces, or in quills about six inches in length, about an inch in breadth, and one-sixth of an inch thick, and obliquely cut on the inner edge; epidermis mottled, brown, or yellowish-grey; inner surface yellowish-brown, flaky; breaking with a short fracture; taste bitter and slightly aromatic; odour musty and disagreeable. When the cut surface is examined with a lens, numerous white points or minute lines are seen; these consist of raphides of oxalate of calcium and liber-fibres. When touched with nitric acid the inner surface of the bark becomes bluish-black; in the case of the false bark the acid produces a red colour. The false bark is generally in shorter pieces, more irregularly twisted, much more bitter than the true; the epidermis is also whitish but spotted red. Cusparia bark contains a trace of volatile oil, some resin, and a principle, *Cusparine* or *Angusturin.*

Official Preparation.—Infusum Cuspariæ.—Infusion of Cusparia (cusparia bark, in No. 40 powder, and distilled water at 120° F. (48°·9 C.)).

Dose.—1 to 2 fluid ounces.

Therapeutics.—An aromatic stomachic, which probably possesses antiperiodic properties; it is used in diarrhœa, dysentery, atonic dyspepsia, and debility. It is much esteemed in South America for the treatment of low malignant fevers.

Adulterations.—The bark of Strychnos Nux Vomica (false

Angustura bark) which yields strychnine and brucine ; these substances are not found in the true bark.

3.—PILOCARPUS PENNATIFOLIUS.

Jaborandi.—Jaborandi. The dried LEAFLETS of Pilocarpus Pennatifolius. Imported from Brazil.

Characters.—Very shortly stalked, generally four inches or more in length, oval-oblong, or oblong-lanceolate, obtuse and emarginate, somewhat unequal at the base, coriaceous, slightly revolute and entire at the margins. Upper surface glabrous (except when young), dull green ; under surface paler, frequently somewhat hairy, having a very prominent midrib ; when held against the light the leaflet is observed to be marked irregularly all over with pellucid dots. Odour when bruised, aromatic ; taste on chewing, at first slightly bitter and aromatic, but becoming subsequently pungent, and causing increased flow of saliva. Contain a liquid alkaloid *Pilocarpine* and also *Jaborine*.

Dose.—5 to 60 grains.

Official Preparations.—EXTRACTUM JABORANDI.—Extract of Jaborandi (jaborandi, in No. 40 powder, proof spirit, and distilled water ; prepared by maceration and percolation, and evaporation to a suitable consistence).

Dose.—2 to 10 grains.

INFUSUM JABORANDI.—Infusion of Jaborandi (jaborandi, cut small, infused with boiling distilled water and strained).

Dose.—1 to 2 fluid ounces.

TINCTURA JABORANDI.—Tincture of Jaborandi (jaborandi, in No. 40 powder, and proof spirit ; prepared by maceration and percolation).

Dose.—$\frac{1}{2}$ to 1 fluid drachm.

Pilocarpinæ Nitras.—Nitrate of Pilocarpine. This salt is obtained by shaking extract of jaborandi with chloroform and alkali, evaporating the chloroformic solution, neutralising the products with nitric acid, and purifying by recrystallisation.

Characters and Tests.—A white crystalline powder, or in acicular crystals ; soluble in 8 or 9 parts of water. Forms with strong sulphuric acid a yellowish solution, which upon

adding bichromate of potassium gradually acquires an emerald-green colour. Burned with free access of air it leaves no ash. Contracts the pupil of the eye.

Dose.—$\frac{1}{20}$ to $\frac{1}{2}$ grain.

Therapeutics.—Jaborandi is a powerful sialogogue and diaphoretic. In large doses it produces vomiting. It diminishes arterial tension, and increases the rapidity of the heart's action; its administration causes flushing of the face, ears, and neck, rapidly followed by the most abundant secretion of saliva and copious perspiration, and subsequent languor and drowsiness. The pupil becomes contracted, and the power of accommodation impaired. Paralysis of the vaso-motor nerves appears to take place. The drug is rapidly eliminated by the kidneys and by the skin. Certain injurious effects are occasionally produced by pilocarpine, such as vomiting, dim vision, swelling of the tonsils and salivary glands, sudden collapse, strangury, diminution in the quantity of urine, and albuminuria. *Pilocarpine* exercises a marked antagonism to atropine, and if sudden collapse occurs during its administration, atropine should be injected subcutaneously. *Jaborine*, however, with regard to its action upon the lungs, pupils, heart, and salivary glands, appears to be physiologically identical with atropine. Jaborandi and its preparations may be used in ophthalmic practice, especially in cases of intraocular hæmorrhage, detachment of the retina, and albuminuric retinitis. In consequence of their diuretic action they may be employed in early stages of coryza, and acute bronchitis; they are chiefly serviceable, however, in dropsy, especially that resulting from Morbus Brightii, since the quantity of water and of urea eliminated is much increased under their influence.

In uræmic convulsions, jaborandi and pilocarpine are very valuable, but they have not proved very successful in convulsions arising from other causes.

In children the drug exerts far less influence than in adults; in the former salivation being mostly absent, and sweating only occasionally and slightly produced. The action must be watched carefully in some cases of fatty degeneration of the heart, in valvular disease, and in emphysema.

4.—RUTA GRAVEOLENS. THE COMMON RUE.

Rutæ Oleum.—Oil of Rue. The oil distilled from the fresh herb of Ruta Graveolens, the common rue (fig. 122) ; a plant growing throughout Europe.

Characters.—Odour disagreeable, colour pale-yellow when recent, taste bitter and acrid. The volatile oil contained in the leaves of rue is said to consist principally of *Euodic Aldehyde*

Fig. 122.—Ruta Graveolens. *a*, its capsule.

combined with a little *Lauric Aldehyde* ; a bitter *extractive* matter is also present in the leaves.

Dose.—1 to 4 minims.

Therapeutics. Oil of rue is a powerful topical stimulant, and has been employed in flatulent colic. It appears to be useful in hysterical affections, and in epilepsy.

Simarubaceæ.

PICRÆNA EXCELSA.

Quassiæ Lignum.—Quassia Wood.—The chips, shavings, or raspings of the wood of Picræna Excelsa. From Jamaica. Two varieties of Quassia (the Amara and Simaruba) are shown in fig. 123.

Characters.—Billets or logs of variable size, frequently as thick as a man's thigh, and covered by a dark-grey bark ; wood

dense, tough, porous, and pale yellowish-white, inodorous, intensely and purely bitter. Commonly met with in chips. Contains a neutral crystallisable principle, *Quassine*, but

FIG. 123.—Quassia Amara. Quassia Simaruba.

possesses no tannin or gallic acid, and may therefore be suitably combined with the salts of iron.

Dose, in powder.—10 to 20 grains.

Official Preparations.—EXTRACTUM QUASSIÆ.—Extract of Quassia (quassia wood, rasped, macerated in distilled water; percolated, and evaporated to a proper consistence).

Dose.—3 to 5 grains.

INFUSUM QUASSIÆ.—Infusion of Quassia (quassia wood, in chips; *cold* distilled water).

Dose.—1 to 2 fluid ounces.

TINCTURA QUASSIÆ.—Tincture of Quassia (quassia wood, in chips; proof spirit).

Dose.—½ to 2 fluid drachms.

Therapeutics.—Quassia is a pure bitter stomachic, without astringency, given in dyspepsia and debility, and employed in the form of an enema for the elimination of thread worms.

Vitaceæ.

VITIS VINIFERA. THE GRAPE-VINE.

Uvæ.—RAISINS.—The ripe FRUIT of Vitis Vinifera. Dried by the heat of the sun, or partly by this heat, and partly by artificial heat; imported from Spain. They contain much

Grape Sugar, with *Acid Tartrate of Potassium*; also some *Malic Acid*.

The Vitis Labrusca (fig. 126) and Vitis Laciniosa (fig. 124) are also cultivated, and both are so intermingled with the Vitis

FIG. 124.—Vitis Laciniosa.

FIG. 125.—Vitis Indica.

FIG. 126.—Vitis Labrusca

Vinifera by hybrid products that for all practical purposes they may be considered as only varieties.

Official Preparations.—Raisins are contained in *Tinctura Cardamomi Composita* and in *Tinctura Sennæ*.

Therapeutics.—Slightly refrigerant, but only used to sweeten preparations.

Zygophyllaceæ.

GUAIACUM OFFICINALE. GUAIACUM SANCTUM.

Guaiaci Lignum.—GUAIACUM WOOD.—The HEARTWOOD of Guaiacum Officinale or Guaiacum Sanctum. Imported from St. Domingo and Jamaica. For use in pharmacy the wood should be deprived of its sapwood, and the heartwood reduced to chips, raspings, or shavings. Contained in *Decoctum Sarsæ Compositum*. The plant and leaf of the guaiacum are shown in figs. 127 and 128.

Guaiaci Resina.—GUAIACUM RESIN.—The RESIN of Guaiacum Officinale, or Guaiacum Sanctum. It is obtained from the stem by natural exudation, by incision, or by heat.

Characters.—The chips or raspings are dark greenish-brown, their taste and odour somewhat aromatic; when touched with

nitric acid they assume a temporary bluish-green colour. In the heartwood is contained a large amount of the *Resina* which is dark brown, brittle, having an aromatic odour, and leaving when tasted a peculiar burning sensation in the throat. The tears are oval-shaped, vary in size, and are often coated on the

FIG. 127.—Guaiacum Officinale. The leaf.

FIG. 128.—Guaiacum Officinale. The plant.

surface with a greenish powder. The resin contains three *Acids*, viz. *Guaiacic*, *Guaiaretic*, and *Guaiaconic Acids*, with other vegetable matters, and a solution of it in spirit develops a blue colour upon the inner surface of a paring of raw potato, due to the gluten being acted upon by the guaiacic acid.

Dose.—10 to 30 grains.

Official Preparations.—MISTURA GUAIACI.—Guaiacum Mixture (guaiacum resin, refined sugar, gum acacia, powdered, and cinnamon water).

Dose.—½ to 2 fluid ounces.

TINCTURA GUAIACI AMMONIATA.—Ammoniated Tincture of Guaiacum (guaiacum resin, in powder, and aromatic spirit of ammonia).

Dose.—½ to 1 fluid drachm.

Resin of guaiacum is also contained in *Pilula Hydrargyri Subchloridi Composita* or *Compound Calomel Pill.*

Therapeutics.—Guaiacum resin, when internally administered, frequently produces heat in the throat, and intestinal irritation, and in large doses induces purging. After absorption

it is stimulant, alterative, and diaphoretic, and is also stated to be emmenagogue. It is given in chronic rheumatism, especially the so-called "cold" variety, in which warmth relieves the suffering; and also in syphilitic periosteal affections, in gout, dysmenorrhœa, and in skin diseases.

Adulterations.—Some other resin, as that of the Coniferæ, known by the turpentine odour. The tincture thrown into water becomes milky by the precipitation of the resin; this milkiness is cleared by solution of potash if only guaiacum resin is present, but not if other resins are present.

Sub-Class II. Calycifloræ.

Amyridaceæ.

1.—CANARIUM COMMUNE?

Elemi.—Manila Elemi.—A concrete resinous exudation, the botanical source of which is undetermined, but is sometimes referred to Canarium Commune. Chiefly imported from Manila.

Characters.—Soft, granular, resinous, colourless when fresh, becoming harder and more resinous by age. Of a pale-yellow tint, with a fragrant fennel-like odour and a bitter aromatic taste. Contains a crystalline resin, *Elemin* or *Amyrin*.

Official Preparation.—Unguentum Elemi.—Ointment of Elemi (elemi and simple ointment).

Therapeutics.—Action similar to the turpentines generally; only used externally as an application to indolent sores and boils.

2.—BALSAMODENDRON MYRRHA.

Myrrha.—Myrrh.—A gum resinous exudation obtained from the stem of Balsamodendron Myrrha (fig. 129). Collected in Arabia Felix and Abyssinia.

Characters.—In irregular-formed tears or masses of agglutinated tears varying in size, somewhat translucent, of a reddish-yellow or reddish-brown colour; often covered by fine powder; fractured surface, irregular and somewhat oily; odour agree-

able and aromatic, taste acrid and bitter. Contains a volatile oil, *Myrrhol*, with a gum and a resin, *Myrrhin*, and certain salts.

Official Preparation. — TINCTURA MYRRHÆ.—Tincture of Myrrh (myrrh, in coarse powder, rectified spirit). Prepared by maceration and percolation.

Dose.—½ to 1 fluid drachm.

Myrrh is also contained in *Decoctum Aloes Compositum*, *Mistura Ferri Composita*, in *Pilula Aloes et Myrrhæ*, *Pilula Asafœtidæ Composita*, and *Pilula Rhei Composita*.

FIG. 129. – Balsamodendron Myrrha. *a*, the leaf; *b*, the fruit.

Therapeutics. — When internally administered, myrrh increases the secretion of the mucous membrane, especially that of the bronchial tubes, and is considered to possess emmenagogue, tonic, and antispasmodic properties; it is frequently combined with the preparations of iron and aloes in the treatment of amenorrhœa, in leucorrhœa, and those mucous discharges which are associated with debility, and has been given in phthisis and chronic bronchitis as an expectorant. It is applied externally, as a topical stimulant, to spongy gums and aphthous sore mouths.

Anacardiaceæ.

PISTACIA LENTISCUS.

Mastiche.—MASTICH.—A CONCRETE RESINOUS EXUDATION obtained by making incisions in the bark of the stem and large branches of Pistacia Lentiscus (fig. 130). Chiefly imported from Turkey and the Levant, and is native of the countries bordering on the Mediterranean. Fig. 131 shows the Pistacia Terebinthus.

Characters.—Rounded, irregular, oblong, or pear-shaped tears. Pale-yellow in colour, frequently glassy and transparent, brittle, fracture conchoidal and pale-yellow; having a faint, agreeable odour. Soluble in ether; becomes plastic when

chewed. Contains an acid resin, *Mastichic Acid* and *Masticin*, a tenacious resin, with traces of an ethereal oil.

Dose.—If administered internally, 20 to 40 grains.

FIG. 130.—Pistacia Lentiscus. Mastich.

FIG. 131.—Pistacia Terebinthus.

Therapeutics.—The action is similar to that of the resin of turpentine. It is little used, but from the agreeable odour it imparts to the breath, it has been employed as a masticatory.

Celastraceæ.

EUONYMUS ATROPURPUREUS. THE WAHOO TREE.

Euonymi Cortex.—EUONYMUS BARK.—The dried ROOT-BARK of Euonymus Atropurpureus (fig. 132) (the wahoo or spindle-tree), imported from America.

FIG. 132.—Euonymus Atropurpureus. The Wahoo Tree.

Characters.—Occurs in quilled or curved pieces, varying in thickness from one-twelfth to one-sixth of an inch. The outer surface is light ash-grey in colour, with darker patches, dirty-white where the epidermis has been rubbed off, soft and friable, with occasional rootlets attached. The inner surface, when free from the white wood, is pale tawny-white and smooth. The bark breaks transversely with a finely fibrous fracture, the middle layer having a laminated appearance;

longitudinally the fracture is smooth. Odour faint but characteristic; taste somewhat mucilaginous, and afterwards bitter and slightly acrid.

Official Preparations.—Extractum Euonymi Siccum.—Dry Extract of Euonymus.—This is commonly known as "Euonymin;" it is prepared from Euonymus bark and rectified spirit by percolation and evaporation, sugar of milk being incorporated with the still fluid extract; the mixture is evaporated over a water bath until, when cold, it becomes brittle. The mass may be powdered and kept in a well-corked bottle.

Dose.—1 to 4 grains.

Therapeutics.—Euonymus bark possesses tonic, cathartic, hydragogue, diuretic, and antiperiodic properties. It is said to act as a cholagogue stimulant, producing no headache or depression; but as an hepatic stimulant it is not nearly so powerful an irritant to the intestines as podophyllin.

Cucurbitaceæ.

1.—CITRULLUS COLOCYNTHIS. THE COLOCYNTH GOURD.

Colocynthidis Pulpa.—Colocynth Pulp.—The dried peeled fruit (pepo), freed from seeds, of Citrullus Colocynthis (figs. 133, 134). Grows on the shores of the Mediterranean and India. Imported chiefly from Smyrna, Trieste, France, and Spain.

Characters.—In broken balls, whitish, about 2 inches in diameter, very light, spongy, tough, and consisting of the pulp in which the seeds are embedded. The rind, when present, hard and yellow, intensely bitter in taste. Contains mucilaginous matters, a crystallisable glucoside, *Colocynthin*, and phosphates of calcium and magnesium.

Dose, in powder.—2 to 8 grains.

Official Preparations.—Extractum Colocynthidis Compositum.—Compound Extract of Colocynth (colocynth pulp, macerated in proof spirit, and the solution added to extract of socotrine aloes, resin of scammony and curd soap, in powder; the spirit is distilled off, and the residue reduced to a pilular

consistence; cardamom seeds, in the finest powder, being added at the end of the process).

Dose.—3 to 10 grains.

Pilula Colocynthidis Composita.—Compound Pill of Colocynth (colocynth pulp; Barbadoes aloes; scammony;

Fig. 133.—Citrullus Colocynthis. The leaf and pepo.

sulphate of potassium (all in powder); oil of cloves; distilled water).

Dose.—5 to 10 grains.

Pilula Colocynthidis et Hyoscyami.—Pill of Colocynth and Hyoscyamus (compound pill of colocynth, extract of hyoscyamus).

Fig. 134.—Citrullus Colocynthis. The leaf and flower.

Dose.—5 to 10 grains.

Therapeutics.—Colocynth is a drastic purgative, producing watery motions, and powerfully stimulating the pelvic organs. When given alone it is apt to gripe, and it is generally combined with other purgatives and carminatives. It is useful in obstinate and habitual constipation, in relieving the portal system in dropsies, in amenorrhœa, and other uterine obstructions. Inflammation of the intestines is occasioned by very large doses of colocynth.

Adulterations.—The extract is occasionally made with the pulp and seeds, by which a larger but less active product is yielded.

2.—ECBALLIUM ELATERIUM. THE SQUIRTING OR WILD CUCUMBER.

Ecballii Fructus.—Squirting Cucumber Fruit.—The fruit, very nearly ripe, of Ecballium Elaterium (figs. 135, 136).

Fig. 135.—Ecballium Elaterium. The Squirting Cucumber.
a, pepo expelling its seed; *b*, stalk; *c*, transverse section of the pepo.

From plants cultivated in Britain. Growing in Greece and Southern Europe.

Characters.—A small green elliptical pepo, about $1\frac{1}{2}$ inches long, covered with soft prickles, and containing the seeds, enveloped by a juicy tissue; the seeds, when ripe, are forcibly expelled, hence the name "squirting cucumber."

Fig. 136.—Ecballium Elaterium.

Elaterium.—Elaterium.—A sediment from the juice of the Squirting Cucumber. The squirting cucumber fruit is cut lengthwise, and the juice pressed lightly out; it is then strained through a hair sieve and set aside to deposit; the supernatant fluid is carefully poured off, and the sediment dried on porous tiles in a warm place.

Characters.—In light friable, flat or slightly curved, opaque, thin cakes; pale-green, yellowish-grey, or greenish-grey; odour faint, taste tea-like, acrid and bitter; fracture finely granular.

Contains an active principle, *Elaterin*, *Elatin*, or *Momordicin*, together with green resinous matter and woody fibre.

Dose.—$\frac{1}{16}$ to $\frac{1}{2}$ grain.

It should yield not less than 20 per cent. of elaterin.

Elaterinum.—Elaterin $C_{20}H_{28}O_5$. This active principle may be obtained by exhausting elaterium with chloroform, then adding ether to the solution, collecting the precipitate, washing it with ether, and purifying by recrystallisation from chloroform.

Characters.—Small colourless crystals, insoluble in water, slightly soluble in rectified spirit. Taste bitter. Chemically neutral. Yields with melted carbolic acid a solution which with sulphuric acid becomes of a crimson colour, changing rapidly to scarlet.

Dose.—$\frac{1}{40}$ to $\frac{1}{10}$ grain.

Official Preparation.—Pulvis Elaterini Compositus. Compound Powder of Elaterin (elaterin and sugar of milk, rubbed in a mortar until reduced to fine powder and intimately mixed). (=1 in 40).

Dose.—$\frac{1}{2}$ grain to 5 grains.

Therapeutics.—A very powerful hydragogue, drastic purgative, chiefly employed in dropsical affections, especially when complicated with heart-disease; it may cause depression and nausea, and must be very carefully administered.

Adulterations.—Starch, flour, or chalk may be present, or but little elaterin (only 4 to 6 per cent.).

Hamamelidaceæ.

HAMAMELIDIS VIRGINICA. THE WITCH HAZEL.

Hamamelidis Cortex.—Hamamelis Bark.—Is also known as the Witch Hazel Bark, or Winter Bloom, and is the dried bark of Hamamelis Virginica (fig. 137).

Imported from the United States of America.

Characters.—In quills or slightly curved pieces from two to six or eight inches long and about one-tenth of an inch in thickness, covered with a silvery-grey or whitish easily detached

scaly outer bark marked with lenticels. Internally, cinnamon-brown or brownish-red and finely striated longitudinally; transverse fracture coarsely fibrous and tough; taste slightly astringent, no strongly marked odour.

Official Preparation.—TINCTURA HAMAMELIDIS.—Tincture of Hamamelis. Prepared from Hamamelis bark by maceration, percolation, and addition of proof spirit.

Dose.—5 to 60 minims.

Hamamelidis Folia.—HAMAMELIS LEAVES.

The dried LEAVES of Hamamelis Virginica (the Witch Hazel).

FIG.—137. Hamamelis Virginica. The Witch Hazel.

Characters.—Shortly petiolate, from four to six inches long, oval, obtuse, wavy-crenate, narrowed below, oblique, and slightly heart-shaped at base, pinnately veined, veins prominent on the under surface, nearly smooth. The leaves have a slight tea-like odour and an astringent and bitter taste.

Official Preparation.—EXTRACTUM HAMAMELIDIS LIQUIDUM.—Liquid Extract of Hamamelis. Prepared from Hamamelis leaves in rectified spirit and water, by maceration, percolation, and evaporation.

Dose.—2 to 5 minims.

This extract is used in preparing the following ointment:

Unguentum Hamamelidis.—OINTMENT OF HAMAMELIS.—(Liquid extract of hamamelis and simple ointment mixed thoroughly.) (= about 1 in 8).

Therapeutics.—Hamamelis is a valuable hæmostatic, useful in hæmorrhoids, hæmoptysis, and menorrhagia, and in all passive hæmorrhages, and in hæmatophilia or the hæmorrhagic diathesis. For bleeding piles one drachm of the tincture in three ounces of cold water should be given as an enema, or the ointment may be applied locally. One or two drachms of the tincture with an ounce of water is serviceable as an application to bruises and small wounds.

Leguminosæ.

SUB-ORDER. PAPILIONACEÆ.

1.—MYROXYLON PEREIRÆ.

Balsamum Peruvianum.—BALSAM OF PERU.—A BALSAM exuded from the trunk of Myroxylon Pereiræ after the bark has been beaten, scorched, and removed. From Salvador, in Central America.

The *Papilionaceæ* are distinguished by their having papilionaceous or butterfly flowers, an illustration of which is seen in the Gompholobium Grandiflorum (fig. 138).

FIG. 138.—Gompholobium Grandiflorum.

Characters.—Thick, viscid, like treacle; when in thin layers, orange-brown or reddish-brown, and translucent, having an acrid taste and a balsamic odour. Soluble in rectified spirit. Contains a neutral volatile oil, *Cinnamein* or *Cinnamate of Benzyl*, also a crystallisable solid, *Meta-Cinnamein*, with *Cinnamic Acid* and resin, and *Styracin* or *Cinnamate of Cinnamyl*.

Dose.—10 to 15 minims, and upwards, made into an emulsion with yolk of egg or mucilage.

Therapeutics.—Peru balsam acts as a stimulant and expectorant, and is given in chronic bronchitis and rheumatism; it is also employed in gleet and leucorrhœa. Locally it is applied as a stimulant to ulcers and bed-sores.

2.—MYROXYLON TOLUIFERA.

Balsamum Tolutanum.—BALSAM OF TOLU.—A BALSAM which exudes from the trunk of Myroxylon Toluifera after incisions have been made in the bark. Grows in Central America, Cartagena, and the mountains of Tolu.

Characters.—A soft, tenacious, reddish-yellow solid, becoming hard by age; with a highly fragrant odour; taste somewhat aromatic, and slightly acid.

It is similar in composition to balsam of Peru, but in addition contains a volatile oil, *Tolene.*

Dose.—10 to 20 grains.

Official Preparations.—SYRUPUS TOLUTANUS.—Syrup of Tolu (balsam of tolu ; refined sugar ; distilled water).

Dose.—1 fluid drachm.

TINCTURA TOLUTANA.—Tincture of Tolu (balsam of tolu and rectified spirit ; prepared by maceration). Contained in *Trochisci : Acidi Tannici ; Morphinæ ; Morphinæ et Ipecacuanhæ ; Opii.*

Dose.—20 to 40 minims.

Balsam of tolu is also contained in the *Pilula Phosphori* and *Tinctura Benzoini Composita.*

Therapeutics.—Exactly similar to balsam of Peru.

3.—ANDIRA ARAROBA. GOA POWDER.

Chrysarobinum. — CHRYSAROBIN. — The MEDULLARY MATTER of the stem and branches of Andira Araroba dried and powdered. It contains more or less chrysophanic acid according to age and condition ; and yields much chrysophanic acid by oxidation.

Characters and Tests.—As purified by solvents a light brownish-yellow minutely crystalline powder, without odour and taste ; very slightly soluble in water. On heating it melts and partially sublimes. It dissolves in sulphuric acid, forming a yellow to orange-red solution, and with solution of caustic potash yields a reddish fluorescent solution which becomes carmine by absorption of oxygen from the air.

Dose.—$\frac{1}{6}$ to $\frac{1}{2}$ grain.

Official Preparation.—UNGUENTUM CHRYSAROBINI.—Ointment of Chrysarobin (chrysarobin added to melted benzoated lard, and the two stirred together until cold). A yellow ointment.

Therapeutics.—Chrysarobin is a powerful parasiticide, and is used as a stimulating and anti-parasitic application in cutaneous affections. It has proved efficacious in ringworm. Its internal employment has been followed by success in acne, eczema, and

psoriasis, but it is apt to occasion violent griping, vomiting, and purging, even after doses so small as $\frac{1}{8}$ grain in a pill. It produces upon the skin and linen a deep purplish discoloration, and is therefore scarcely suitable for application to the face. Its action is both constitutional and local. Experiments have shown that the chrysarobin ointment applied externally has become absorbed, and in fact converted (by oxidation) in the system into chrysophanic acid. The non-oxidised portion appeared in the urine.

4.—GLYCYRRHIZA GLABRA.

Glycyrrhizæ Radix.—Liquorice Root.—The root and subterranean stems or stolons, fresh and dried, of Glycyrrhiza Glabra (fig. 139). Cultivated in Britain.

Characters.—In long cylindrical branched pieces, varying in size, brown on the surface and yellow within; pliable and tough; odour peculiar, earthy, and somewhat sickly; of a sweet mucilaginous and slightly acrid taste. Contains gum, mucilage, and *Asparagine*, and a peculiar sweet brownish substance, *Glycyrrhizine*, or "liquorice sugar," which, upon boiling with hydrochloric acid, yields *Glycyrretin*, a bitter resinous matter, and glucose.

Fig. 139. Glycyrrhiza Glabra. The Liquorice.

Official Preparations.—Extractum Glycyrrhizæ.—Extract of Liquorice (liquorice root, in No. 20 powder, macerated and percolated with distilled water, and then evaporated to a proper consistence). Contained in *Confectio Sennæ*, *Decoctum Aloes Compositum*, *Tinctura Aloes*, and *Trochisci Opii*.

Extractum Glycyrrhizæ Liquidum.—Liquid Extract of Liquorice (liquorice root, in No. 20 powder, macerated in distilled water, and strained, and rectified spirit added to

prevent decomposition). Contained in *Mistura Sennæ Composita* and *Tinctura Chloroformi et Morphinæ.*

Dose.—1 fluid drachm.

Pulvis Glycyrrhizæ Compositus.—Compound Powder of Liquorice (senna, liquorice, refined sugar, fennel fruit; all in fine powder).

Dose.—30 to 60 grains.

Liquorice root is also contained in *Confectio Terebinthinæ, Decoctum Sarsæ Compositum, Infusum Lini, Pilula Hydrargyri,* and *Pilula Ferri Iodidi.*

Therapeutics.—Liquorice is demulcent; it allays cough, but is more frequently employed for covering the taste of other medicines. The action of the compound powder is purgative.

5.—PTEROCARPUS MARSUPIUM. INDIAN KINO TREE.

Kino.—Kino.—The juice obtained from incisions made in the trunk of Pterocarpus Marsupium (fig. 140) inspissated without artificial heat. Imported from Malabar.

Characters.—In small, angular, brittle, glistening, opaque, reddish-black fragments, translucent, and ruby-red on the edges, inodorous, very astringent. Tinges the saliva red when chewed. Almost entirely soluble in rectified spirit. Contains red gummy matter and *Mimo-tannic* or *Catechu-tannic Acid,* and an astringent principle, *Catechin.*

Fig. 140.—Pterocarpus Marsupium. The Kino Tree.

Dose.—10 to 30 grains.

Official Preparations.—Pulvis Kino Compositus.—Compound Powder of Kino (kino, opium, cinnamon bark; all in powder). Contains 1 part of opium in 20.

Dose.—5 to 20 grains.

Tinctura Kino.—Tincture of Kino (kino, in coarse powder, glycerine, distilled water, and rectified spirit). Prepared by maceration and filtration.

Dose.—½ to 2 fluid drachms.

Powdered Kino is also contained in *Pulvis Catechu Compositus*.

Therapeutics.—Kino is a powerful astringent, acting both locally and generally. It is very useful in diarrhœa, dysentery, and relaxed sore throat, and may be administered in all cases where tannin is indicated.

6.—PHYSOSTIGMA VENENOSUM.

Physostigmatis Semen.—Calabar Bean.—The dried seed of Physostigma Venenosum. Western Africa.

Characters.—About the size of a very large horse-bean, with a firm, hard, shining testa or integument of a brownish-red or deep chocolate-brown colour. Oblong, and more or less kidney-shaped, and with a furrow running longitudinally along its convex side. Within the shell is a kernel consisting principally of two cotyledons, hard, white and brittle, and separated from each other by a largish cavity. When moistened with water, the cotyledons become of a permanent pale-yellow colour. The kernel is composed of starch, legumin, and a fatty oil, with mucilage, a little sugar, and the active principle *Physostigmina* or *Eserina*.

Dose, in powder.—1 to 4 grains.

Official Preparation. — Extractum Physostigmatis. — Extract of Calabar Bean (Calabar bean, in No. 40 powder, and rectified spirit).

Dose.—$\frac{1}{16}$ to $\frac{1}{4}$ grain.

Physostigmina.—Physostigmine or Eserine, $C_{15}H_{21}N_3O_2$. This is an alkaloid obtained from the alcoholic extract of Calabar bean by dissolving the extract in water, adding sodium bicarbonate, shaking the mixture with ether, and finally evaporating.

Characters.—Colourless or pinkish crystals slightly soluble in water. The aqueous solution, when warmed with diluted solution of potash, becomes red, and after evaporation to dryness leaves a blue residue, the acidified solution of which is beautifully dichroic, being blue and red.

LAMELLÆ PHYSOSTIGMINÆ.—Discs of Physostigmine (discs of gelatine with some glycerine, each disc weighing $\frac{1}{50}$ grain, and containing $\frac{1}{1000}$ grain of physostigmine).

Therapeutics.—Poisonous doses of the Calabar bean may cause death by asphyxia or cardiac paralysis. In medium doses, or when the poison is absorbed gradually, asphyxia takes place. If the dose is large, or when the poison is introduced directly into the system, death results from paralysis of the heart.

Physostigma acts as a depressant on the heart, reducing the number of its pulsations; when it is applied to the eye, the pupil contracts; and this contraction is occasioned when internal administration of the drug has produced rapid poisoning, but it may be overlooked through the subsequent dilatation.

Calabar bean has been exhibited internally in cases of strychnine-poisoning, chorea, tetanus, and general paralysis of the insane, and externally in some conditions of the eye.

7.—PTEROCARPUS SANTALINUS.

Pterocarpi Lignum.—RED SANDAL WOOD.—The sliced or rasped HEART-WOOD of Pterocarpus Santalinus. From Ceylon and Coromandel.

Characters.—Imported in dense, heavy billets, outwardly dark-brown, internally variegated with blood-red and lighter red rings, if cut transversely. Powder blood-red, of a faint, peculiar odour, and an obscurely astringent taste. Also chips of the same. Red Sandal Wood contains a dark-red crystalline principle, *Santalin* or *Santalic Acid*, also *Santal*, and a small quantity of *Catechu-tannic Acid*. Solutions of metallic salts are incompatible with sandal wood, since acids precipitate the *Santalin*, throwing down red or violet precipitates.

Red sandal wood is employed to give colour to the *Tinctura Lavandulæ Composita*, and through it to the *Liquor Arsenicalis*.

8.—CYTISUS SCOPARIUS. THE COMMON BROOM.

Scoparii Cacumina.—Broom Tops. The fresh and dried tops of Cytisus Scoparius. From indigenous plants.

Characters.—Straight, branched, with five wing-like angles, dark-green or yellowish-green, nearly smooth, tough, of a bitter, nauseous taste, and of a peculiar odour when bruised. Contain a neutral principle *Scoparine*, on which the diuretic properties depend, and *Sparteina*, a volatile liquid alkaloid.

Official Preparations.—Decoctum Scoparii.—Decoction of Broom (broom tops, dried, added to distilled water, and then boiled and strained).

Dose.—2 to 4 fluid ounces.

Succus Scoparii.—Juice of Broom (fresh broom tops and rectified spirit; one measure of spirit is added to every three of juice).

Dose.—1 to 2 fluid drachms.

Therapeutics.—Broom acts as a diuretic. It is chiefly employed in dropsies, dependent upon cardiac disease. In large doses it causes vomiting and purging.

The alkaloid Sparteina is analogous to conine and paralyses the motor nerves of the spinal cord; it is said also to paralyse the cardiac inhibitory branches of the pneumogastric. Mammals are destroyed by sparteine, since the activity of the respiratory centre in the medulla oblongata becomes impaired.

9.—ASTRAGALUS GUMMIFER.

Tragacantha.—Tragacanth.—A gummy exudation, obtained by making incisions in the stem of Astragalus Gummifer (fig. 141), and some other species of Astragalus. Collected in Asia Minor.

Characters.—White or yellowish, in thin flaky pieces; waved concentrically; inodorous, almost tasteless, tough; very sparingly soluble in cold water, but swelling into a gelatinous mass. Contains two distinct gums, *Arabine*, soluble in water, and *Bassorine*, insoluble in water, together with a small quantity of starch.

Official Preparations.—Mucilago Tragacanthæ.—Mucilage of Tragacanth (tragacanth, in powder, distilled water, and rectified spirit).

Glycerinum Tragacanthæ. — Glycerine of Tragacanth (tragacanth, in powder, glycerine and distilled water). A translucent jelly.

Pulvis Tragacanthæ Compositus. — Compound Powder of Tragacanth (tragacanth, gum acacia, starch, and refined sugar; all in powder).

Fig. 141.—Astragalus Gummifer. The Tragacanth.

Dose.—20 to 60 grains.

Powdered tragacanth is also contained in *Confectio Sulphuris*, *Confectio Opii*, and *Pulvis Opii Compositus*.

Therapeutics.—This substance is a simple demulcent. The mucilage is employed for the suspension of heavy powders, such as the subnitrate of bismuth. One part of tragacanth is said to render water more viscid than even 25 parts of gum arabic.

Sub-Order. Cæsalpinieæ.

10.—CASSIA FISTULA. THE PURGING CASSIA.

Cassiæ Pulpa.—Cassia Pulp.—The pulp obtained from the recently imported pods of Cassia Fistula (fig. 142). From the East or West Indies. Used in *Confectio Sennæ*.

Fig. 142.—Cassia Fistula. The Purging Cassia.

Fig. 143.—Cassia Arborescens.

The *Cæsalpinieæ* do not have butterfly flowers. The flower of this sub-order is shown in the Cassia Arborescens (fig. 143).

Characters. — Blackish-brown, pods about 2 feet long, nearly an inch in diameter, with two longitudinal bands extending the whole length; internally divided by transverse

partitions into numerous cells, each containing a seed enveloped in a soft pulp which is viscid, sweet in taste, blackish-brown, and somewhat sickly in odour ; usually containing the seeds and dissepiments. Contains pectin, sugar, mucilage, and a principle probably similar to that found in Senna.

Dose, of the prepared pulp.—120 grains and upwards.

Therapeutics.—A slight laxative ; seldom given alone, since it is liable to produce flatulence.

11.—COPAIFERA LANGSDORFFII.

Copaiba.—COPAIVA.—The OLEO-RESIN obtained by cutting deeply or boring into the trunk of Copaifera Langsdorffii (fig. 144) and other species of Copaifera, as the Coriacea (fig. 145),

FIG. 144.—Copaifera Langsdorffii.

FIG. 145.—Copaifera Coriacea.

the Officinalis (fig. 146), and the Oblongifolia (fig. 147). Chiefly from the valley of the Amazon. Grows in the West Indies and tropical parts of America.

Characters.—A liquid more or less viscid, light yellow, generally transparent, with a peculiar aromatic odour, and a persistent acrid somewhat bitter taste. Dissolves $\frac{1}{4}$ of its weight of carbonate of magnesium on heating. Consists of a resin, *Copaivic Acid*, and a *volatile oil* closely allied to oil of turpentine. Also contains a soft brown resinous matter the nature of which is unknown.

Dose.—$\frac{1}{2}$ to 1 fluid drachm.

Copaibæ Oleum.—Oil of Copaiva.—The oil distilled from Copaiva.

Characters.—Colourless or pale-yellow, with the odour and taste of copaiva.

Dose.—5 to 20 minims.

Therapeutics.—Copaiba is valuable in the treatment of affections of the bladder and urethra, as cystitis, gleet, and leucorrhœa, and may be employed with advantage in chronic bronchitis, especially when accompanied by excessive secretion of mucus. It should be avoided in febrile conditions, or in renal dropsy, or where there is evidence of renal

Fig. 146.—Copaifera Officinalis.

Fig. 147.—Copaifera Oblongifolia.

congestion. It is powerfully diuretic. The volatile oil acts in a similar manner to that of the balsam. To cover the disagreeable taste the drug is often placed in gelatinous or membranous capsules.

Adulterations.—Copaiva may be mixed with turpentine and fixed oils. Turpentine can be detected by its odour on heating the suspected drug on paper; and all fixed oils by a greasy ring which surrounds the resinous stain that is left by pure copaiva.

12.—HÆMATOXYLUM CAMPECHIANUM.

Hæmatoxyli Lignum.—Logwood.—The sliced heartwood of Hæmatoxylum Campechianum (fig. 148). Native of Campeachy, and growing in the West Indian Islands and in India.

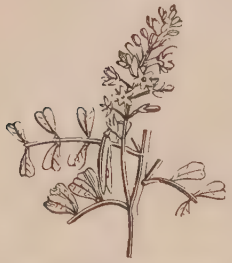


Fig. 148.—Hæmatoxylum Campechianum. The Logwood.

Characters.—The logs are externally hard, heavy, and blackish-red, internally they are reddish-brown ; the chips have a reddish-brown colour, feeble peculiar agreeable odour, and sweetish astringent taste ; a small portion, when chewed, imparts to the saliva a brilliant, dark, reddish-pink colour. Contains a principle, *Hæmatoxyline*, together with tannin and resin, and the ordinary constituents of wood.

Official Preparations.—Decoctum Hæmatoxyli.—Decoction of Logwood (logwood, in chips ; cinnamon bark, bruised ; distilled water ; boiled and strained).

Dose.—1 to 2 fluid ounces.

Extractum Hæmatoxyli.—Extract of Logwood (logwood, in fine chips, and boiling distilled water. Prepared by maceration and evaporation to a proper consistence).

Dose.—10 to 30 grains.

Therapeutics.—Logwood is chiefly used as an astringent in diarrhœa, chronic dysentery, and some forms of atonic dyspepsia, and is often given to children. It imparts to the urine a pink colour when that fluid becomes alkaline.

13.—CASSIA ACUTIFOLIA.

Senna Alexandrina.—Alexandrian Senna.—The leaflets of Cassia Acutifolia (figs. 149, *a*, and 150) and other varieties of Cassia. Imported from Alexandria ; sometimes in a contaminated condition, in which case the true senna leaflets should be carefully separated from all extraneous matters. The leaves of Solenostemma Argel (fig. 151) may be present.

Characters.—Lanceolate or oval-lanceolate, obovate leaflets, about an inch long, acute, unequal at the base, entire, brittle, pale greyish-green, evidently veined on the lower surface, and finely pubescent or nearly smooth, of a faint peculiar tea-like odour, and mucilaginous nauseous sickly taste. The unequally

FIG. 149.—Alexandrian Senna. *a*, leaf of Cassia Acutifolia; *g*, pod of same; *b*, leaf of Cassia Obtusata; *c*, leaf of Cassia Obovata; *h*, pod of same; *e*, leaf of Cynanchum Oleæfolium; *k*, pod of same; *d*, leaf of Tephrosia Apollinea; *i*, pod of same; *f*, leaf of Coriaria Myrtifolia.

oblique base and absence of bitterness distinguish the senna from the Argel leaves, which are, moreover, stiffer and thicker.

Official Preparations.—CONFECTIO SENNÆ.—Confection of Senna (senna, in fine powder; coriander fruit, in fine powder; figs; tamarind; cassia pulp; prunes; extract of liquorice; refined sugar; distilled water).

Dose.—60 to 120 grains.

Infusum Sennæ.—Infusion of Senna (senna ; ginger, sliced ; boiling distilled water). Infused and strained.

Fig. 150.—Cassia Acutifolia. *a*, an expanded flower.

Dose.—1 to 2 fluid ounces. Contained (as is also the tincture of senna) in the mixture following.

Mistura Sennæ Composita.—Compound Mixture of

Fig. 151.—Solenostemma Argel. Flowers, leaf, and fruit.

Senna, the ordinary Black Draught (sulphate of magnesium ; liquid extract of liquorice ; tincture of senna ; compound tincture of cardamoms ; infusion of senna).

Dose.—1 to 1½ fluid ounces.

Syrupus Sennæ.—Syrup of Senna (senna, broken small; oil of coriander; refined sugar; distilled water; rectified spirit).

Dose.—1 to 4 drachms.

Tinctura Sennæ.—Tincture of Senna (senna, broken small; raisins, freed from seeds; caraway fruit, bruised; coriander fruit, bruised; proof spirit).

Dose.—1 to 4 fluid drachms.

Senna is also contained in *Pulvis Glycyrrhizæ Compositus*.

14.—CASSIA ANGUSTIFOLIA.

Senna Indica.—East Indian or Tinnivelly Senna.—The dried leaflets of Cassia Angustifolia (fig. 152). From plants cultivated in Southern India; it is imported without admixture of other leaves or extraneous matters of any kind. May be used in place of the Alexandrian Senna.

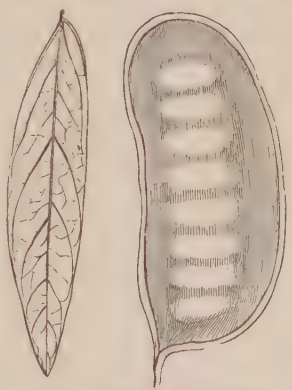


Fig. 152.—Cassia Angustifolia. East Indian Senna. *a*, legume; *b*, leaflet.

Characters.—About one to two inches long, lanceolate, acute, unequal-sided at the base, thin, entire, yellowish-green and smooth above, somewhat duller beneath, and glabrous or slightly pubescent; odour and taste very similar to Alexandrian Senna.

Senna has a faint odour and a nauseous taste, and contains *Cathartine* or *Cathartic Acid*, a non-crystallisable yellowish-red deliquescent substance.

Adulterations.—Solenostemma Argel (fig. 151), Colutea Arborescens, Coriaria Myrtifolia, Cynanchum Oleæfolium, and Tephrosia Apollinea (fig. 149).

Therapeutics.—Senna is a somewhat brisk purgative; it appears to act chiefly on the small intestines, and sometimes creates griping and nausea if given alone; it is therefore usually combined with salines, as tartrate of potassium or, with Epsom salt and some aromatic, as in the "black draught."

15.—TAMARINDUS INDICA. THE TAMARIND TREE.

Tamarindus.—TAMARIND.—The preserved PULP of the fruit of Tamarindus Indica (fig. 153). Growing in the East and West Indies. Contained in *Confectio Sennæ.*

FIG. 153.—Tamarindus Indica. The Tamarind Tree.

Characters.—A reddish-brown, sweetish, moist sugary mass, enclosing strong branched fibres and brown shining seeds, each enclosed in a membranous coat. Taste agreeable, refreshing, and sub-acid. Contains sugar, gum, pectin, free citric, tartaric, and malic acids, acid tartrate of potassium, etc. The seeds contain much tannin.

Dose.—$\frac{1}{4}$ ounce and upwards. By boiling the pulp with milk, a whey may be obtained.

Therapeutics.—Tamarinds exert a very slight laxative action; on account of the acid contained they are refrigerant, and are useful when infused, as a cooling drink in febrile affections.

SUB-ORDER. MIMOSEÆ.

16.—ACACIA SENEGAL.

Acaciæ Gummi.—GUM ACACIA.—A GUMMY EXUDATION from the stem and branches of Acacia Senegal, and from other species of Acacia, as the Acacia Vera (fig. 155) and Arabica (fig. 154). Chiefly collected in Kordofan in Eastern Africa, and imported from Alexandria.

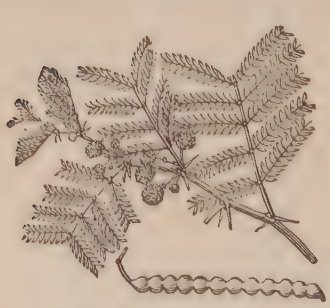


FIG. 154.—Acacia Arabica.

A group of plants belonging to the sub-order *Mimoseæ* is shown in fig. 156.

Characters.—In roundish or spheroidal tears or masses of variable size, or in angular fragments with glistening surfaces, nearly colourless, and opaque, from numerous minute cracks, or with a yellowish or reddish tint; brittle; bland and

mucilaginous in taste. Quite soluble in water, forming a mucilage. Consists of *Gummic* or *Arabic Acid*, or *Arabin*,

FIG 155.—Acacia Vera.

combined with magnesium, calcium, and potassium ; also small quantities of malate of calcium, chlorides of calcium and

FIG. 156.—Group of plants belonging to the sub-order Mimoseæ.

potassium, with traces of iron, silica, and phosphate of calcium. The solution of gum acacia forms an opaque white jelly upon the addition of lead sub-acetate.

Official Preparations.—MUCILAGO ACACIÆ.—Mucilage of Gum Acacia (gum acacia, in small pieces; distilled water). Strained, if necessary, through muslin.

Gum Acacia is also contained in *Mistura Cretæ*, *Mistura Guaiaci*, *Pulvis Amygdalæ Compositus*, *Pulvis Tragacanthæ Compositus*, and its mucilage is used in all the *Trochisci*.

Therapeutics of GUM ACACIA.—Gum acts as a simple demulcent, and is used to relieve irritation of the mucous membranes, as those of the fauces, pharynx, stomach, bladder, and urethra; it is also frequently employed for suspending heavy powders, as oxide of zinc and subnitrate of bismuth when administered in a liquid form, but tragacanth for this purpose is to be preferred.

17.—INDIGOFERA.

Indigo, C_8H_5NO.—A BLUE PIGMENT prepared from various species of Indigofera, as the Indigofera Tinctoria (fig. 157).

Characters.—In cubical plates, of an intense blue colour, without odour, and having a metallic taste. When rubbed with a smooth hard body it assumes a coppery hue. Contains a blue colouring matter, *Indigotin*, or *Indigo Blue*, changed into white indigo by deoxidising agents. Indigo is introduced into the Appendix of the Pharmacopœia for making the

FIG. 157.—Indigofera Tinctoria. The Indigo Plant.

Solution of Sulphate of Indigo (indigo, dry and in fine powder, dissolved in sulphuric acid by the aid of heat).

This solution contains a compound of sulphuric acid and indigotin, called *Sulphindigotic Acid*; it is used as a test for free chlorine in hydrochloric acid and liquor sodæ chlorinatæ. Free chlorine, if present, destroys the blue colour.

Therapeutics.—Indigo has been given in epilepsy, but its action as a therapeutic agent needs further investigation. By it the urine is coloured green or bluish-green.

Myrtaceæ or Granateæ.

1.—EUGENIA CARYOPHYLLATA. THE CLOVE TREE.

Caryophyllum. — CLOVE. — The dried FLOWER-BUD of Eugenia Caryophyllata (figs. 158, 159). Growing in the East Indian Islands, in Penang, Bencoolen, and Amboyna.

Dose, in powder.—5 to 20 grains or more.

Characters.—About six lines long, small, tapering, nail-like, dark reddish-brown, consisting of a four-toothed calyx, between which the

FIG. 158.—The Mother Clove.

FIG. 159.—Eugenia Caryophyllata. The Clove.

unopened corolla appears like a round ball ; having a fragrant odour, and a bitter spicy pungent taste. Emits oil when indented with the nails. Contains a volatile oil, resin, tannin, and woody fibre. The volatile oil consists of a hydrocarbon, holding in solution *Eugenic Acid*, a crystallisable body *Caryophylline*, isomeric with camphor, and *Eugenine*.

Official Preparation.—INFUSUM CARYOPHYLLI.—Infusion of Cloves (cloves, bruised ; boiling distilled water).

Dose.—1 to 4 fluid ounces.

Cloves are also contained in *Infusum Aurantii Compositum*, *Mistura Ferri Aromatica*, and *Vinum Opii*.

Caryophylli Oleum.—OIL OF CLOVES.—The OIL distilled in Britain from cloves.

Characters.—Colourless or pale-yellow when recent, but gradually becoming reddish-brown, having the odour of clove, and its taste in a high degree. Sinks in water.

Dose.—1 to 4 minims.

Contained in *Confectio Scammonii*, *Pilula Colocynthidis Composita*, and *Pilula Colocynthidis et Hyoscyami*.

Therapeutics.—Cloves and the oil are aromatic, carminative, and stimulant; given in dyspepsia to relieve flatulence, and to allay vomiting in pregnancy. The oil may be employed as an adjunct to purgatives, or applied locally to stay the pain of carious teeth.

Incompatibles.—Salts of iron strike black with clove preparations, in consequence of the contained tannin.

2.—MELALEUCA MINOR. THE CAJUPUT TREE.

Cajuputi Oleum.—Oil of Cajuput.—The oil distilled from the leaves of Melaleuca Minor (fig. 160). Growing in the Molucca Islands. Imported from Batavia and Singapore.

Fig. 160. Melaleuca Minor. The Cajuput Tree.

Characters.—A transparent, limpid, very volatile, pale, bluish-green liquid. Has a strong, agreeable, camphoraceous odour and taste, and leaves a sensation of coldness in the mouth. When distilled, a colourless oil, *Hydrate of Cajuputene*, comes over, which constitutes two-thirds of the crude oil.

Official Preparation.—Spiritus Cajuputi. Spirit of Cajuput (oil of cajuput dissolved in rectified spirit). = (1 in 50).

Dose.—½ to 1 fluid drachm.

Oil of cajuput is also contained in *Linimentum Crotonis*.

Therapeutics.—Cajuput oil is a powerful general and topical stimulant and antispasmodic, used in hysteria, cholera, and flatulent colic; also in low states of the system and in chronic rheumatism. When mixed with olive-oil, it is applied over gouty and chronic rheumatic parts.

Adulteration.—In certain samples copper has been found, but this substance is not essential to the green colour of the oil. Camphor dissolved in oil of rosemary and coloured by copper is stated to have been substituted for the genuine oil.

3.—EUCALYPTUS ROSTRATA. THE RED GUM TREE.

Eucalypti Gummi.—EUCALYPTUS GUM.—A ruby-coloured exudation, or so-called RED GUM, from the bark of the Eucalyptus Rostrata (fig. 161) (the red gum-tree), and some other species. Imported from Australia.

FIG. 161. Eucalyptus Rostrata. The Red Gum Tree.

Characters and Tests.—From eighty to ninety per cent. of this gum is soluble in cold water, forming a neutral solution. It is almost entirely soluble in rectified spirit.

Dose.—2 to 10 grains.

Therapeutics.—The Eucalyptus gum resembles catechu and kino in its properties and composition. It is intensely astringent to mucous membranes. Is valuable in relaxed throats, and has been given with success for arresting the purging of mercurial pill when this has been administered in syphilis.

4.—EUCALYPTUS GLOBULUS. EUCALYPTUS AMYGDALINA. THE BLUE GUM TREE.

Eucalypti Oleum.—OIL OF EUCALYPTUS.—EUCALYPTOL. The OIL distilled from the fresh leaves of Eucalyptus Globulus, Eucalyptus Amygdalina (fig. 162), and probably other species of Eucalyptus. Cultivated in South Europe, Algeria, etc. Native of Tasmania.

Dose.—1 to 4 minims.

Characters.—A colourless or pale straw-coloured oil, becoming darker and thicker by exposure. It is contained in the oil-glands of the leaves. Has an aromatic odour, and a pungent

spicy flavour, leaving a sensation of coldness in the mouth. Soluble in about an equal weight of alcohol.

Used in preparing the following.

Official Preparation.—Eucalypti Unguentum.—Ointment of Eucalyptus. Hard and soft paraffins are melted together, oil of Eucalyptus being then added, and the whole stirred until cold. = (1 in 5).

Fig. 162.—Eucalyptus Amygdalina. The Blue Gum Tree.

Therapeutics. — Experiments have shown that Eucalyptol possesses antiseptic powers, even greater than those of quinine. It reduces the temperature of the body somewhat in health. It is excreted by the kidneys and the lungs, and causes a smell of violets in the urine.

It has been used in surgery for these antiseptic properties, but is liable to produce local irritation. It has been also employed as an inhalation in phthisis, bronchitis, ozæna, and diphtheria, and is highly recommended as a hypodermic injection in the treatment of pyæmia.

The Eucalyptus leaves have been smoked for the relief of bronchitis, asthma, and pertussis.

5.—PUNICA GRANATUM.

Granati Radicis Cortex.—Pomegranate Root Bark.—The dried bark of the root of Punica Granatum (figs. 163, 164, 165). Grows on the shores of the Mediterranean; it is chiefly imported in a dried state from Germany.

Characters.—In small quills or fragments of a greyish-yellow colour externally, wrinkled and furrowed, yellow internally and smooth, having a short fracture, no odour, and an astringent slightly bitter taste. The root bark contains tannin and a principle called *Punicine*, and two liquid alkaloids, *Pelletierine* and *Isopelletierine*.

Official Preparation.—Decoctum Granati Radicis.—Decoction of Pomegranate Root (pomegranate root bark, sliced, distilled water). Boiled and strained.

Fig. 163.—Punica Granatum. *a*, *a*, scarlet-flowered; *b*, white-flowered.

Fig. 164.—Section of the fruit of Punica Granatum, showing the two strata of rind.

Fig. 165.—Punica Granatum.

The Pomegranate.

Dose.—2 to 4 fluid ounces.

Therapeutics.—Somewhat astringent, and may be employed when tannin is indicated. It has been used to expel tape-worms, but is far inferior to the extract of male fern

6.—PIMENTA OFFICINALIS. THE ALL-SPICE TREE.

Pimenta.—PIMENTO.—The dried unripe full-grown FRUIT of Pimenta Officinalis (fig. 166). Grows in the West Indies.

FIG. 166.—Pimenta Officinalis. The All-Spice.

Characters.—A small round two-celled berry, a little larger than pepper, the surface brown, rough, and crowned with the teeth of the calyx, and containing two dark-brown seeds. Odour and taste warm, aromatic, and peculiar, but resembling cloves. It contains a fixed oil, resin, tannin, and a volatile oil, apparently identical with oil of cloves.

Official Preparation.—AQUA PIMENTÆ. Pimento Water (pimento, bruised, mixed with water and distilled).

Pimentæ Oleum.—OIL OF PIMENTO.—The OIL distilled in Britain from pimento.

Characters.—Colourless or slightly yellowish-red when recent, but becoming brown by age, having the odour and taste of pimento. Sinks in water.

Dose.—1 to 4 minims.

Therapeutics.—The same as cloves.

Rhamnaceæ.

1.—RHAMNUS FRANGULA. THE BLACK ALDER.

Rhamni Frangulæ Cortex.—The dried BARK of Rhamnus Frangula (fig. 167). Collected from the young trunk and moderate-sized branches, and kept for one year at least before being used. Grown in Germany, Holland, and other parts of Europe. A plant belonging to *Rhamnaceæ*, the Celastrus Pyracantha, is shown in fig. 168.

Characters.—In small quills; the bark itself is about one twenty-fifth of an inch or rather more in thickness, coated by a greyish-brown or blackish-brown corky layer, which is marked with transverse whitish lenticels; inner surface smooth and brownish-yellow; fracture short and purplish externally, but

somewhat fibrous and yellowish within. Taste pleasant sweetish, and slightly bitter. No marked odour. Contains a constituent termed *Frangulin.*

Official Preparations.—EXTRACTUM RHAMNI FRANGULÆ.—Extract of Rhamnus Frangula (Rhamnus Frangula bark in

FIG. 167.—Rhamnus Frangula. The Black Alder.

FIG. 168.—Celastrus Pyracantha.

No. 40 powder, proof spirit, and water. Prepared by maceration, percolation, and evaporation).

Dose.—15 to 60 grains.

EXTRACTUM RHAMNI FRANGULÆ LIQUIDUM.—Liquid Extract of Rhamnus Frangula (Rhamnus Frangula bark, in coarse powder, rectified spirit, and distilled water).

Dose.—1 to 4 fluid drachms.

Therapeutics.—The bark, when fresh, acts as an irritant poison, inducing vomiting and purging. When dried its action is far less violent, and it may be given as a purgative in cases of chronic constipation.

2.—RHAMNUS PURSHIANUS. CASCARA SAGRADA. THE SACRED BARK.

Rhamni Purshiani Cortex.—The dried BARK of Rhamnus Purshianus. Obtained from California.

Characters.—In quills or incurved pieces, varying in length and size, the bark itself about one twenty-fifth to one-eighth of an inch thick; nearly smooth externally, and coated with a greyish-white layer, which is generally removed easily, and is often marked with spots or patches of adherent lichens. Beneath the surface it is violet-brown, reddish-brown, or

brownish ; internally reddish-brown or yellowish-brown, nearly smooth, but longitudinally somewhat striated. Fracture short, except internally, where it is slightly fibrous. Taste bitter ; no marked odour. Often imported in flattened packets, which consist of small pieces of the bark compressed into a more or less compact mass. Contains an active principle similar to that of the Rhamnus Frangula.

Official Preparations.—Extractum Cascaræ Sagradæ.—Extract of Cascara Sagrada (Cascara Sagrada in No. 40 powder, proof spirit, and distilled water. Prepared by maceration, percolation, and evaporation).

Dose.—2 to 8 grains.

Extractum Cascaræ Sagradæ Liquidum.—Liquid Extract of Cascara Sagrada (Cascara Sagrada, in coarse powder ; rectified spirit ; and distilled water).

Dose.—½ to 2 fluid drachms.

Therapeutics.—The Sacred Bark possesses purgative and tonic properties. It has been employed in chronic constipation, especially when accompanied by hæmorrhoids. It is said to be an efficient purgative, frequently inducing complete evacuation of the colon without causing irritation of the rectum.

Rosaceæ.

1.—PRUNUS AMYGDALUS (AMARA AND DULCIS). THE ALMOND TREE.

Amygdala Amara.—Bitter Almond.—The ripe seed of the bitter almond tree, Prunus Amygdalus (figs. 169, 170) or Amara. Brought chiefly from Mogadore.

Characters.—Similar to the sweet almond in appearance, but it is rather broader and shorter ; it also has a bitter taste, and when rubbed with water emits an odour like that of ratafia or peach blossoms.

Amygdala Dulcis.—Sweet Almond.—The ripe seed of the sweet almond tree, Prunus Amygdalus or Dulcis. Cultivated about Malaga.

Characters.—About an inch in length, nearly oblong, some-

what compressed, rounded at one end, pointed at the other, covered by a cinnamon-brown scurfy coat, and having a bland sweet nutty taste. When bruised with water it forms a white emulsion, having an agreeable taste, but possessing no marked odour.

Both varieties of almond yield on expression the Oleum Amygdalæ, in company with *Emulsine* or *Synaptase*, sugar, gum, woody fibre, and inorganic salts, especially phosphates of potassium, calcium, and magnesium. In addition to these the bitter almond contains *Amygdaline*.

Upon moistening the bitter almond the amygdaline is acted

Fig. 169.—Prunus Amygdalus.

Fig. 170.—Section of the Almond.
a, one of the Cotyledons;
b, Radicle and Plumule.

upon by the emulsine, a species of fermentation is set up, and *prussic acid* and *volatile oil of bitter almonds* or *hydride of benzol* together with *glucose* and *formic acid* are formed.

Official Preparations.—Pulvis Amygdalæ Compositus.—Compound Powder of Almonds (sweet almonds; refined sugar, in powder; gum acacia, in powder). Contained in the following:

Mistura Amygdalæ.—Almond Mixture (compound powder of almonds; distilled water).

Dose.—1 to 2 fluid ounces.

Amygdalæ Oleum.—The oil expressed from bitter or sweet almond.

Characters.—Thin pale-yellow, nearly inodorous, having

a nutty bland oleaginous taste. It is contained in the *Unguenta: Cetacei, Resinæ*, and in *Unguentum Sulphuris*, and the preparations which contain that ointment; also in *Oleum Phosphoratum*.

Therapeutics.—Sweet almonds are nutritive and demulcent. They are more commonly used as vehicles for the administration of other remedies. In large doses the fixed oil is purgative. In large quantities bitter almonds are poisonous, and their employment is not advisable, in consequence of the amount of prussic acid generated being very variable.

An almond-cake, made from the non-amylaceous powder of the sweet almond, has been proposed as a substitute for bread in the treatment of Saccharine Diabetes.

2.—HAGENIA ABYSSINICA.

Cusso.—Kousso. The dried PANICLES (chiefly of the female flowers) of Hagenia Abyssinica (fig. 171). Collected in Abyssinia. Growing chiefly some thousand feet above the sea-level.

Characters.—In compressed clusters or cylindrical rolls some ten inches in length with small, reddish greenish brown flowers on hairy stalks, the outer limb of calyx five-partite, the segments oblong or oblong lanceolate, reticulated. General colour in mass is reddish or brownish, the red edges of the petals of the flower appearing fairly often as streaks. Has a herby, tea-like odour. Taste bitter and acrid. Contains a volatile oil, gum, sugar, tannic acid, wax, and a crystallisable principle, *Koussine*.

Dose.—$\frac{1}{4}$ to $\frac{1}{2}$ ounce.

Official Preparation.—INFUSUM CUSSO.—Infusion of Kousso (kousso, in coarse powder; boiling distilled water; prepared *without* straining).

Dose.—4 to 8 fluid ounces.

Therapeutics of Kousso.—An efficient anthelmintic, but it

Fig. 201.—*Hagenia Abyssinica*. *A*, flowering branch. *B*, branch of female flowers; *C*, flower seen laterally. *D*, female flower; *a*, *a*, *a*, *a*, *a*, the five outer segments of the calyx.

3.—PRUNUS LAUROCERASUS. THE CHERRY-LAUREL.

Laurocerasi Folia.—CHERRY-LAUREL LEAVES.—The fresh LEAVES of Prunus Laurocerasus (fig. 172). Native of Asia Minor, but cultivated in England.

FIG. 172.—Prunus Laurocerasus. The Cherry-Laurel.

Characters.—Oblong or somewhat obovate, five to seven inches long, tapering to each end, distantly toothed, furnished with glands at the base, smooth and shining, deep green, thick, coriaceous, on strong short footstalks; emitting a ratafia odour when bruised. Upon distilling the leaves of the cherry laurel (Prunus Laurocerasus) with water, some volatile oil and *prussic acid* are yielded. This fact is due to the decomposition of the *Amygdaline* contained in the leaves. Only half as much prussic acid is yielded in winter as in July and August.

Official Preparation.—AQUA LAUROCERASI.—Cherry Laurel Water (fresh leaves of cherry-laurel and water; distilled).

Dose.—5 to 30 minims.

Therapeutics.—The action is the same as that of diluted hydrocyanic acid (see p. 43). The strength of the cherry laurel water is very variable, and on this account its use is objectionable; some physicians consider it an elegant method of administering hydrocyanic acid.

4.—PRUNUS DOMESTICA. THE PLUM.

Prunum.—PRUNE.—The dried DRUPE of Prunus Domestica or Juliana (fig. 173). Growing in Syria and various parts of Europe. Imported from the south of France. Prunes are about

one inch long, ovoid or oblong, black and shrivelled, sweet and somewhat acid. They are contained in *Confectio Sennæ*. They contain free malic acid, sugar, and a purgative principle, the nature of which is unknown. Their action is laxative. Seldom prescribed.

Fig. 173. Prunus Domestica. The Plum.

5.—ROSA CANINA. THE DOG-ROSE.

Rosæ Caninæ Fructus.—Fruit of the Dog-rose.—Hips.—The ripe fruit of Rosa Canina and other allied species. Indigenous.

Characters.—An inch or more in length, ovate, scarlet or red, smooth, shining ; inodorous ; taste, sweetish, acidulous, pleasant. The pulp contains malic and citric acids, malates and citrates, tannic acid, sugar, and a trace of volatile oil.

Official Preparation.—Confectio Rosæ Caninæ.—Confection of Hips (hips, deprived of their seed-like fruits ; refined sugar, gradually added, and the whole pounded together until incorporated).

Therapeutics.—Slightly refrigerant and astringent.

Dose.—60 grains or more.

6.—ROSA CENTIFOLIA. THE HUNDRED-LEAVED, DAMASK OR CABBAGE-ROSE.

Rosæ Centifoliæ Petala.—Cabbage-Rose Petals.—The fresh, fully expanded petals of Rosa Centifolia. From plants cultivated in Britain. Native of Persia and the Caucasus.

Characters.—Large, thin, delicate, very fragrant, and having a slightly astringent, bitterish taste. They lose their odour by drying. Both odour and taste readily imparted to water. The odour is due to a volatile oil termed *Otto*, or *Attar*, of *Roses*, a very small quantity of which exists in the rose petals, and which is prepared in India. The petals also contain colouring matter, a slight laxative principle, with traces of tannic and gallic acids.

Official Preparation.—Aqua Rosæ.—Rose-water (fresh

petals of the hundred-leaved rose—or the petals preserved while fresh with common salt. Added to water and distilled). Contained in *Mistura Ferri Composita* and *Trochisci Bismuthi.*

Therapeutics.—Rose-water is used chiefly for making lotions and collyria. It is also an agreeable vehicle in which to administer medicines.

7.—ROSA GALLICA. THE RED OR FRENCH ROSE.

Rosæ Gallicæ Petala.—Red Rose Petals.—The fresh and dried unexpanded petals of Rosa Gallica. From plants cultivated in Britain. Grows in Austria and south of Europe.

Characters.—Generally in little cone-like masses, or separate and somewhat crumpled. Colour fine purplish-red, retained after drying, velvety; taste bitterish, feebly acid and astringent; odour fragrant, roseate, especially developed by drying. Contain *red colouring matter*, a trace of *volatile oil*, *tannic* or *gallic* acid. An infusion of the petals becomes green with alkalies and bright red with acids.

Official Preparations.—Confectio Rosæ Gallicæ.—Confection of Roses (fresh red-rose petals, pounded in a mortar; refined sugar added, and the whole again pounded until incorporated). Contained in *Pilulæ: Aloes Barbadensis; Aloes et Asafœtidæ; Aloes et Ferri; Aloes Socotrinæ; Ferri Carbonatis; Hydrargyri; Plumbi cum Opio.*

Infusum Rosæ Acidum.—Acid Infusion of Roses (dried red-rose petals, broken up; diluted sulphuric acid; boiling distilled water). Of a bright red colour; due to the action of the acid upon the colouring matter of the petals.

Dose.—1 to 2 fluid ounces.

Syrupus Rosæ Gallicæ.—Syrup of Red Roses (dried red-rose petals; refined sugar; boiling distilled water).

Dose.—1 fluid drachm.

Therapeutics.—These petals are astringent, but more often used on account of their colouring matter. The confection is used as a pill basis, and is also applied in aphthous conditions

of the mouth in the form of a linctus. The acid infusion is a useful gargle, and is given internally as an astringent, or an agreeable vehicle for more powerful medicines, as Epsom salt and sulphate of quinine. The syrup is employed as a colouring agent.

Umbelliferæ.

1.—DOREMA AMMONIACUM.

Ammoniacum.—Ammoniacum.—A gum-resinous exudation from the stem (after being punctured by beetles) of Dorema Ammoniacum. Collected in Persia and the Punjaub.

Characters.—In separate tears or masses, sometimes as large as a cherry; pale yellowish-brown when fresh, but becoming cinnamon-brown by keeping; milky-white internally, breaking with a dull waxy fracture; hard and brittle when cold, but readily softening with heat. Has a faint peculiar odour, and a bitter, acrid taste. Rubbed with water it forms a nearly white emulsion. Contains a *resin*, *gum*, and a volatile oil which is destitute of sulphur.

Dose.—10 to 20 grains.

Official Preparations.—Emplastrum Ammoniaci cum Hydrargyro.—Ammoniacum and Mercury Plaster (ammoniacum; mercury; olive oil; sublimed sulphur).

Mistura Ammoniaci.—Ammoniacum Mixture (ammoniacum, in coarse powder; distilled water).

Dose.—½ to 1 fluid ounce.

Ammoniacum is also contained in *Emplastrum Galbani*, *Pilula Scillæ Composita*, and *Pilula Ipecacuanhæ cum Scilla*.

Therapeutics.—Ammoniacum in large doses may cause nausea; after absorption its action seems chiefly directed to the mucous membranes, especially those of the bronchial tubes. It is a powerful stimulating expectorant, very useful in some cases of chronic bronchitis. Externally applied, it acts as a local irritant, and the Emplastrum Ammoniaci cum Hydrargyro has been known to cause a papular or even pustular eruption. Ammoniacum is often employed for dispersing indolent tumours and diminishing chronically enlarged joints.

2.—PEUCEDANUM GRAVEOLENS. THE DILL.

Anethi Fructus.—Dill fruit.—The dried FRUIT of Peucedanum Graveolens (fig. 174). Cultivated in England, or imported from middle and Southern Europe.

FIG. 174.—Peucedanum Graveolens. The Dill.

Characters.—Broadly oval, about one-sixth of an inch in length, flat, and surrounded by a broad membranous border. Of a brown colour, the membranous border being paler. The half fruits or mericarps are generally distinct in the fruits of commerce. The odour and taste are agreeably aromatic.

Official Preparation.—AQUA ANETHI.—Dill water (dill fruit, bruised; mixed with water, and distilled).

Dose.—1 to 2 fluid ounces. For infants, 1 to 2 fluid drachms.

Anethi Oleum.—OIL OF DILL.—The OIL distilled in Britain from dill fruit.

Characters.—Colour pale-yellow, odour pungent, taste hot and sweetish. Resembles oil of caraway in appearance. Contains *Anethene*, and in composition probably resembles other umbelliferous oils.

Dose.—1 to 4 minims.

Therapeutics.—Aromatic, carminative, and stimulant. It is a useful adjunct to purgatives, and is chiefly given to relieve flatulence in infants.

3.—PIMPINELLA ANISUM. ANISE.

Anisi Fructus.—ANISE FRUIT.—The dried FRUIT of Pimpinella Anisum.

Characters.—The fruits average about $\frac{1}{5}$ inch in length. The Russian variety is shorter. They are ovoid-oblong, greyish-brown, and are covered with short hairs; consist of two mericarps united. Each mericarp has five slender ridges, its transverse section showing about fifteen vittæ. Taste sweet and spicy, odour agreeable and aromatic.

Aqua Anisi.—Anise water (anise fruit, bruised, added to water and distilled).

Anisi Oleum.—Oil of Anise.—The oil distilled in Europe from the anise fruit, or in China from star anise fruit (page 195).

Characters.—Colourless or very pale-yellow, with the odour of the fruit, and an aromatic sweetish taste. Concretes between 50° and 60° F. (10° to 15°·5 C.). Oil of star anise only becomes solid at a few degrees above the freezing point of water.

Consists of two portions, about $\frac{1}{5}$ being a liquid oil, which is isomeric with oil of turpentine ($C_{10}H_{16}$) and $\frac{4}{5}$ an oil solidifying below 50°, and termed *Anethol* or *Anise-Camphor*, which is easily oxidised, yielding substances containing the radical *Anisyl* ($C_8H_7O_2$).

Dose.—1 to 4 minims. It is contained in the following.

Official Preparation.—Essentia Anisi.—Essence of Anise, oil of anise and rectified spirit. = (1 in 5).

Dose.—10 to 20 minims.

Oil of anise is also contained in *Tinctura Camphoræ Composita* and *Tinctura Opii Ammoniata.*

Therapeutics.—Stimulant, aromatic, and carminative ; it is employed for the relief of flatulence, and to diminish the griping of purgatives.

4.—FERULA NARTHEX. FERULA SCORODOSMA.

Asafœtida.—Asafœtida.—A gum-resin obtained by incision from the living root of Ferula Narthex (fig. 175), of Ferula Scorodosma, and probably other species. Native of Persia, Afghanistan, and the Punjaub.

Characters.—Usually in irregular masses of agglutinated tears, moist or dry. A freshly cut or broken piece is amygdaloid in appearance, and consists of the harder whitish tears with softer uniting brownish-red matter. The colour is opaque white, but by exposure gradually becomes purplish-pink and finally dull-yellowish brown. Taste bitter, alliaceous, and acrid ; odour fetid, alliaceous, and persistent. Should almost entirely dissolve in rectified spirit, its pulverisation being facilitated by rubbing with carbonate of ammonium. Contains a *volatile oil,*

consisting of *Sulphide of Allyl*, *gum*, and *resin*, yielding *Ferulaic Acid* and some saline matters.

In the **Extraction of Asafœtida** (fig. 176) incisions are made into the upper part of the root, the footstalks of the leaves and fibres at the top of the root having been removed.

According to Kiempfer the business of collecting consists of four parts. The *first* commences about the middle of April by digging the earth about the root, removing the fibres and leaves,

Fig. 175.—Ferula Narthex. Asafœtida.

which are afterwards laid over the root to shield it from the sun. The *second* begins about the end of May. Each collector is furnished with a knife to cut the root, an iron spatula to scrape off the juice, a cup fixed to his thigh to receive it, and two baskets hung over his shoulders upon a pole. The top of the root is then cut off transversely, and three days later the juice is scraped off and put into the cups. A fresh incision is then made, and the juice removed the day but one following, when the roots are again cut. The cups are from time to time emptied into large vessels. The juice is exposed to the sun to become harder, and is conveyed home in baskets. The *third* and *fourth* acts are mere repetitions of the second, and are performed at intervals of about three weeks. Except after the last operation, the roots are carefully protected from the sun, after each incision, by covering them with leaves.

Dose.—5 to 20 grains.

Official Preparations.—Enema Asafœtidæ.—Enema of Asafœtida (asafœtida ; distilled water).

Pilula Asafœtidæ Composita.—Compound Pill of Asafœtida (asafœtida ; galbanum ; myrrh ; treacle).

Dose.—5 to 10 grains.

Tinctura Asafœtidæ.—Tincture of Asafœtida (asafœtida in small fragments, macerated in rectified spirit, and filtered).

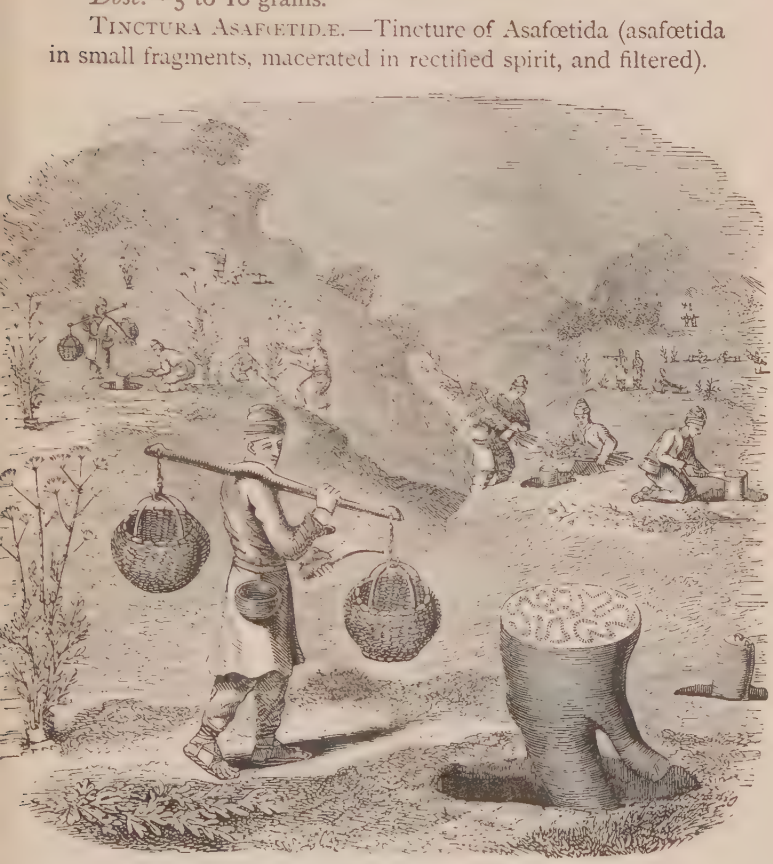


Fig. 176.—Extraction of Asafœtida.

Dose.—½ to 1 fluid drachm.

Asafœtida is also contained in *Pilula Aloes et Asafœtidæ* and *Spiritus Ammoniæ Fœtidus.*

Therapeutics.—A powerful stimulant and antispasmodic to the nervous system, especially useful in convulsive hysterical

affections; it is also used in asthma and pertussis. May be employed as an enema in tympanites. Serviceable also as an expectorant in some forms of chronic bronchitis. Its value is probably due to the contained sulphur oil. Galbanum and ammoniacum, since they are devoid of the sulphur oil, possess no true antispasmodic powers when given alone.

Adulterations.—Mechanical impurities, as stones and sand, are occasionally present.

5.—CARUM CARUI. THE CARAWAY.

Carui Fructus.—CARAWAY FRUIT.—The dried FRUIT of Carum Carui (fig. 177). Cultivated in England and Germany.

Characters.—The caraway *seeds* (mericarps) or fruit are slightly somewhat curved, tapering at each end, brown, with five paler longitudinal ridges, having a large vitta in each intervening space; they possess an agreeable aromatic odour and spicy taste. Contain a *volatile oil*, consisting of two liquid portions, viz. an oxidised oil termed *Carvol*, and an unoxidised, *Carvene*.

FIG. 177.—Carum Carui. The Caraway.

Official Preparations.—AQUA CARUI.—Caraway Water (caraway fruit, bruised, mixed with water and distilled).

Dose.—1 to 2 fluid ounces.

Carui Oleum.—OIL OF CARAWAY.—The OIL distilled in Britain from Caraway fruit.

Characters.—Colourless or pale-yellow when recent, gradually becoming darker, having the odour of the fruit, and a spicy taste. Contained in *Confectio Scammonii* and *Pilula Aloes Barbadensis*.

Dose.—2 to 5 minims.

Caraway fruit is also contained in *Confectio Opii*, *Confectio Piperis*, in *Pulvis Opii Compositus*, *Tinctura Cardamomi Composita*, and *Tinctura Sennæ Composita*.

Therapeutics.—Very similar to Anise and Dill, and used for the same purposes.

6.—CONIUM MACULATUM. THE SPOTTED HEMLOCK.

Conii Folia.—Hemlock Leaves.—The fresh leaves and young branches of Conium Maculatum (fig. 177*a*); gathered from wild British plants when the fruit begins to form.

Characters. — Leaves decompound, smooth, arising from a smooth stem, with dark purple spots; deep green in colour, shining, having pinnatifid leaflets, the petioles furrowed and sheathing at the base, those of the lower leaves being hollow. Odour strong, very disagreeable. The leaf rubbed with solution of potash emits strongly the mouse-like odour of conine.

Dose, in powder.—2 to 8 grains.

Fig. 177*a*.—Conium Maculatum. The Hemlock. *a*, the fruit with its undulated crenated primary ridges; *b*, transverse section of the fruit.

Official Preparations:

Extractum Conii.—Extract of Hemlock (the fresh leaves and young branches of hemlock; prepared like the other green extracts).

Dose.—2 to 6 grains. This extract is used in the following preparations, viz.:

Pilula Conii Composita.—Compound Pill of Hemlock (extract of hemlock; ipecacuanha, in powder; treacle).

Dose.—5 to 10 grains.

Succus Conii.—Juice of Hemlock (fresh leaves and young branches of hemlock ; 1 part of rectified spirit being added to every three parts of the juice). Used in *Unguentum Conii.*

Dose.—½ to 1 fluid drachm.

Cataplasma Conii.—Hemlock Poultice (juice of hemlock ; linseed meal ; boiling water).

Vapor Coninæ.—Inhalation of Conine (juice of hemlock, solution of potash, and distilled water). Put 20 minims of the mixture on a sponge, in a suitable apparatus, so that the vapour of hot water passing over it may be inhaled.

Conii Fructus.—Hemlock Fruit.—The fruit of Conium Maculatum (fig. 176). Gathered when fully developed, but while still green, and dried carefully.

Characters.—Broadly ovate and compressed laterally ; generally consisting of the separated mericarps. It is recognised from all other umbelliferous fruits by its five crenated ridges, without evident vittæ. Reduced to powder and rubbed with solution of potash, it emits strongly the disagreeable odour of conine.

Official Preparation.—Tinctura Conii.—Tincture of Hemlock (hemlock fruit, finely comminuted ; proof spirit) ; prepared by maceration and percolation.

Dose.—20 to 60 minims.

Both the leaves and fruit of Conium contain a non-poisonous volatile oil, in company with *Conine*, a volatile liquid alkaloid, and united with *Conic Acid* as *Conate of Conine*. Conium also contains in small quantity a base termed *Conhydrine.*

Conina is a strongly alkaline fluid, colourless when pure, and having a characteristic odour resembling that of mice. With *nitric acid* it gives a *blood-red* colour ; by *sulphuric acid* it is turned *purplish-red*, changing to *green* ; and when gently warmed with *hydrochloric acid* it forms a *greenish-blue* crystalline mass. It produces a greasy stain on paper which disappears on heating, and it is always accompanied by *Methyl-Conine.*

The vapour of conine is inflammable.

Therapeutics.—The physiological effects of the Hemlock are entirely due to the conine and methyl-conine it contains. The

strength of the various preparations of the plant is extremely uncertain, since these alkaloids are exceedingly volatile and prone to decomposition.

Conine is stated to occasion paralysis of the voluntary muscles by a selective action upon the end-organs of the motor nerves. It does not affect the brain, the spinal cord, the muscular tissue, and the afferent nerves. Gradual enfeeblement of the respiratory muscles ensues, and by their ultimate paralysis death by asphyxia results. The heart's action is not directly interfered with.

Methyl-conine exerts a special influence upon the spinal cord as well as upon the end-organs of the motor nerves, first exalting and then abolishing the reflex function. Thus the action of pure conine is considerably modified, since it is always associated with methyl-conine.

When a full dose of any active preparation of conium is taken by a healthy man, weakness of the legs and staggering gait ensue ; early implication of the third cranial nerve takes place, resulting in ptosis (dropping of the upper eyelid) and dilatation of the pupil ; the cerebral functions are unaffected, but the muscular debility increases, and is followed by drowsiness and sleep ; nausea and pallor are not unfrequently observed.

Conium is administered for the relief of muscular spasm in paralysis agitans, mercurial tremor, chorea, and the violent twitchings of the legs which are sometimes observed in paraplegia. In strychnine poisoning and tetanus it is valueless.

In the form of the vapor coninæ the drug may be employed to relieve the cough of bronchitis, pertussis, or phthisis. It has been recommended in acute mania, and was at one time considered to be a remedy for cancer, often diminishing the pain and improving the general health.

7.—CORIANDRUM SATIVUM. CORIANDER.

Coriandri Fructus.—Coriander Fruit.—The dried ripe fruit of Coriandrum Sativum (fig. 177*b*). Cultivated in Britain ; native of Italy.

Characters.—Globular, nearly as large as white pepper,

beaked, finely ribbed, yellowish-brown, consisting of two adherent mericarps, which can be readily separated. Taste aromatic and agreeable ; when bruised odour pleasant. Contained in *Confectio Sennæ*, *Syrupus Rhei*, *Tinctura Rhei*, and *Tinctura Sennæ*.

Fig. 177*b*.—Coriandrum Sativum. The Coriander.

Dose, of the powdered fruit.—10 to 30 grains or more.

Coriandri Oleum.—Oil of Coriander.—The oil distilled in Britain from coriander fruit. Contained in *Syrupus Sennæ*.

Characters.—Colourless or pale yellow, having the odour of the fruit, and a mild aromatic taste. Consists of a mixture of several oils, principally a volatile oxygenated oil and a non-oxygenated and less volatile oil.

Dose.—1 to 4 minims.

Therapeutics.—Stimulant, carminative, and aromatic like Anethum, Anisum, and Carum Carui. It is seldom given alone.

8.—FŒNICULUM CAPILLACEUM. FENNEL.

Fœniculi Fructus.—Fennel Fruit. —The dried fruit of cultivated plants of Fœniculum Capillaceum (fig. 178). Imported from Malta, grows in most parts of Europe.

Fig. 178.—Fœniculum Capillaceum. The Fennel.

Characters. — $\frac{1}{6}$ to $\frac{2}{3}$ of an inch long, and oblong or ovoid oblong ; slightly curved, capped by a conspicuous stylopod and two styles. The fruit readily separated into its two mericarps, each of which

has five ridges, the lateral being the broadest; four vittæ in the grooves, two in the commissure; greenish-brown or brown; taste and odour aromatic. Contains a light yellow volatile oil identical with oil of anise, and possessing the characteristic odour of the fruit.

Official Preparation.—Aqua Fœniculi.—Fennel Water (fennel fruit, bruised, added to water and distilled).

Dose.—1 to 2 fluid ounces.

Fennel fruit is also contained in the *Pulvis Glycyrrhizæ Compositus.*

Therapeutics.—Aromatic, carminative, and stimulant like Anethum and Anisum.

9.—FERULA GALBANIFLUA; RUBRICAULIS.

Galbanum.—Galbanum.—A gum-resin, obtained from Ferula Galbaniflua (fig. 179), Ferula Rubricaulis, and probably other species. Imported from India and the Levant.

Fig. 179. Ferula Galbaniflua. The Galbanum.

Characters.—In tears about the size of a pea, or in masses of agglutinated tears, roundish or irregular; greenish-yellow, orange brown, or yellowish-brown, more or less translucent, having a peculiar aromatic odour, and a bitter taste, somewhat alliaceous.

The masses, which usually contain pieces of root, stem, and other impurities, are generally hard, irregular, and yellowish-brown or rarely greenish.

Contains a *volatile oil* destitute of sulphur, also a gum *resin* which yields a substance termed *Umbelliferone.*

Dose.—10 to 30 grains or more.

Official Preparation.—Emplastrum Galbani.—Galbanum Plaster (galbanum, ammoniacum, yellow wax, and lead plaster).

Galbanum is also contained in *Pilula Asafœtidæ Composita.*

Therapeutics.—Resembles asafœtida, but possesses far less powerful antispasmodic properties. Its action is probably more allied to that of ammoniacum. It is occasionally used as an expectorant, and has been given in amenorrhœa from its supposed stimulating action on the uterus. Externally it is employed for the discussion of indolent tumours.

10.—FERULA SUMBUL.

Sumbul Radix.—Sumbul Root.—The Musk Root. The dried transverse sections of the root of Ferula Sumbul. Imported from Russia and also from Bombay. Native of Bokhara.

Characters.—Varying in size, usually from about 1 inch to 3 inches in diameter, and from $\frac{3}{4}$ to $1\frac{1}{2}$ inch in thickness. The pieces are covered on the outer surface with a dusky-brown papery transversely wrinkled bark, sometimes beset with short bristly fibres. Internally spongy, coarsely fibrous, dry, and dirty-yellowish-brown, mottled with whitish patches and spots of exuded resin. It has a strong odour, resembling that of musk. The taste is at first sweetish, becoming after a time bitter and aromatic. That brought from India differs from the Russian, being closer in texture, more dense and firm, and of a reddish tint. The root contains a resin, starch, and a little *volatile oil*. The resin is converted by potash into *Sumbulic Acid*, which smells strongly of musk.

Official Preparation.—Tinctura Sumbul.—Tincture of Sumbul (sumbul root, in No. 40 powder; proof spirit).

Dose.—10 to 30 minims.

Therapeutics.—Sumbul is a nervine stimulant resembling Valerian in its action. It has been employed in the treatment of chorea, epilepsy, and other nervous disorders, and is stated to be sometimes beneficial in delirium tremens.

Sub-Class III. Corollifloræ.

Asclepiadaceæ.

HEMIDESMUS INDICUS. INDIAN SARSAPARILLA.

Hemidesmi Radix.—Hemidesmus Root.—The dried root of Hemidesmus Indicus (fig. 180). Imported from India.

Characters.—Yellowish-brown, cylindrical, tortuous, furrowed longitudinally, and with annular cracks, having a fragrant odour resembling the Tonquin bean, and a very agreeable flavour Taste sweetish but slightly acrid. Contains a volatile, crystallisable substance, which has been called *Hemidesmic Acid.*

Fig. 180.—Hemidesmus Indicus. The Indian Sarsaparilla.

Official Preparation. — Syrupus Hemidesmi. — Syrup of Hemidesmus (hemidesmus root, bruised; refined sugar; boiling distilled water).

Dose.—1 fluid drachm.

Therapeutics.—Tonic, alterative, diaphoretic, and diuretic properties have been ascribed to Hemidesmus. It has been used as a substitute for sarsaparilla in the treatment of syphilitic cutaneous eruptions. The syrup is rather a flavouring than a medicinal agent, since the amount of the drug contained in an ordinary dose of this preparation is extremely small. When the real action of hemidesmus is desired, a decoction should be made from the root, and given in doses of from 1 to 4 fluid ounces.

Atropaceæ.

1.—ATROPA BELLADONNA. THE DEADLY NIGHTSHADE.

Belladonnæ Folia.—Belladonna Leaves.—The fresh leaves, with the branches to which they are attached, of Atropa Belladonna (fig. 181); also the leaves separated from the branches and carefully dried; gathered when the fruit has

begun to form from plants growing wild or cultivated in Britain.

Characters.—Leaves alternate below, three to eight inches long, broadly ovate, acute, entire, smooth, the uppermost in pairs and unequal. The expressed juice, or an infusion, dropped into the eye, dilates the pupil. Contain *Atropine*, and, in addition to ordinary ingredients, *Asparagin*, a neutral substance converted by alkalies or acids into ammonia and *Aspartic Acid*.

FIG. 181.—Atropa Belladonna. The Deadly Nightshade.

Official Preparations.—EXTRACTUM BELLADONNÆ.—Extract of Belladonna (the fresh leaves and young branches of belladonna ; a green extract).

Dose.—$\frac{1}{4}$ to 1 grain.

SUCCUS BELLADONNÆ.—Juice of Belladonna (fresh leaves and young branches of belladonna ; rectified spirit).

Dose.—5 to 15 minims.

TINCTURA BELLADONNÆ.—Tincture of Belladonna (belladonna leaves, in No. 20 powder ; proof spirit).

Dose.—5 to 20 minims.

Belladonnæ Radix.—BELLADONNA ROOT.—The ROOT of Atropa Belladonna carefully dried ; from plants growing wild or cultivated in Britain or imported in a dried state from Germany.

Characters.—From one to two feet long, and from half an inch to two inches thick, in rough irregular branched pieces covered with dirty grey or brownish integument, easily scraped off with the nail ; exposed surface whitish. An infusion dropped into the eye dilates the pupil. Contains *Atropine*, together with *Belladonnin*, an amorphous alkaloid, and a red colouring matter, *Atrosin*.

Official Preparations.—LINIMENTUM BELLADONNÆ.—Liniment of Belladonna (belladonna root, in No. 40 powder ; camphor ; rectified spirit).

EXTRACTUM BELLADONNÆ ALCOHOLICUM.—Alcoholic Extract of Belladonna. Belladonna root, in No. 20 powder ; rectified spirit and distilled water.

Dose.—$\frac{1}{16}$ to $\frac{1}{4}$ grain. Used in preparing the two following :

Emplastrum Belladonnæ.—Belladonna Plaster (alcoholic extract of belladonna, resin plaster, and soap plaster).

Unguentum Belladonnæ. — Ointment of Belladonna (alcoholic extract of belladonna ; prepared lard).=(1 in 10.)

Atropina.—Atropine, $C_{17}H_{23}NO_3$.—An alkaloid obtained from Belladonna (belladonna root, recently dried and in coarse powder ; rectified spirit ; slaked lime ; diluted sulphuric acid ; carbonate of potassium ; chloroform ; purified animal charcoal ; distilled water).

The root is digested with rectified spirit to exhaust it of its *Malate of Atropine* : upon the addition of the slaked lime, *Malate of Calcium* is formed and *Atropine* liberated ; sulphuric acid is added to form *Sulphate of Atropine* ; carbonate of potassium is then added to neutralisation in order to separate the resinous matter, which is subsequently removed by filtration. Carbonate of potassium is again added in sufficient quantity to produce alkalinity, *Sulphate of Potassium* being formed, and *Atropine* liberated, which is removed by chloroform ; the chloroform is distilled off, and the *Atropine* purified by solution in spirit, digestion with animal charcoal, filtration, and evaporation.

Characters and Tests. — In colourless acicular crystals, sparingly soluble in water, more readily soluble in alcohol and ether. Its solution in water has an alkaline reaction, and a bitter taste, powerfully dilates the pupil, and gives a *citron-yellow* precipitate with perchloride of gold. It is an active poison, and is decomposed by strong hydrochloric acid, or by caustic alkalies, baryta or lime water, into *Tropic Acid* ($C_9H_{10}O_3$) and *Tropine* ($C_8H_{15}NO$).

Unguentum Atropinæ.— Ointment of Atropine (atropine, rectified spirit, and prepared lard ; about 8 grains to the ounce).

Atropinæ Sulphas.—Sulphate of Atropine (atropine, distilled water, and diluted sulphuric acid, evaporated to dryness).

Characters.—A colourless powder, insoluble in chloroform, and which, applied in solution to the eye, dilates the pupil. A powerful poison.

Official Preparation. — Liquor Atropinæ Sulphatis. — Solution of Sulphate of Atropine (sulphate of atropine, and distilled water).=(1 in 100.)

Lamellæ Atropinæ.—Discs of Atropine. Discs of gelatine with some glycerine, each weighing about $\frac{1}{50}$ grain and containing $\frac{1}{5000}$ grain of sulphate of atropine.

Used for dilating the pupils.

Therapeutics.—The physiological action of belladonna is exclusively dependent upon the quantity of atropina it contains. Pigeons, dogs, and rabbits are peculiarly insusceptible to its action; the minimum fatal dose for the rabbit is 15 grains.

When atropine is applied to the conjunctiva, the pupil becomes dilated, accommodation being impaired. These effects are probably due to the terminal filaments of the 3rd cranial nerve (motor oculi) becoming paralysed. Atropine introduced into the blood produces the same effects upon the iris and ciliary muscle, with this exception that they are then symmetrical, and not only unilateral.

Atropine is eliminated by the urine, and its presence may be easily shown in this fluid. It arrests all other secretions, as saliva and milk.

The action of atropine is stated to be antagonistic to that of Calabar bean, opium, and hydrocyanic acid.

When belladonna has been taken by a healthy adult, the first symptoms observed are dryness of the throat, thirst, dysphagia, and difficulty of swallowing; if the drug be continued, or the dose increased, the pupils become dilated, vision for near objects being indistinct. Still further effects are—an erythematous rash, resembling scarlatina, quickened pulse, vertigo, excitement, delirium, and confusion of speech, with hallucinations of the senses; micturition becomes frequent. Great muscular weakness and tremors may follow, with hurried breathing, convulsions, coma, and death.

Belladonna and atropine may be applied locally for the relief of pain, to moderate inflammatory action, to arrest secretion, and for some ophthalmic purposes.

Plasters and fomentations of Belladonna are useful in certain forms of hyperæsthesia and neuralgia, especially when these are due to spinal irritation. When applied to the female breast, Belladonna checks the *secretion of milk*. And it is stated to exert a favourable influence upon carbuncles, and even to arrest

suppuration when applied sufficiently early to the inflamed part.

In ophthalmic practice Atropine is employed:

To dilate the pupil for ophthalmoscopic examination, to admit more light into the eye in early stages of central cataract. In iritis, to prevent posterior synechia, and to counteract the effect of Calabar bean. To paralyse accommodation, as in hypermetropia. To reduce intra-ocular tension, as in some forms of corneal ulcer, and glaucomatous conditions of the globe. Atropine, applied to the conjunctival surface, may be absorbed; and it sometimes, though rarely, gives rise to constitutional effects.

As a constitutional remedy, belladonna may be given in the form of extract, tincture, or juice; the sulphate of atropine is used exclusively for subcutaneous injection.

Belladonna is administered:

As an antidote in poisoning by opium, Calabar bean, or hydrocyanic acid. As a laxative in chronic constipation. To check incontinence of urine in children and paraplegic patients.

In many nervous disorders; epilepsy, chorea, pertussis, laryngismus stridulus, asthma. To allay pain and spasm in neuralgic affections, gastrodynia, colic, and spasm of the different sphincters, as of the uterus, bladder, and rectum.

To reduce the quantity of urine; to diminish polyuria in diabetes. The alkaloid atropine is not suited for internal administration; very uncomfortable symptoms have resulted from $\frac{1}{25}$ grain. When injected under the skin, the amount should be from $\frac{1}{250}$ grain, upwards. Sulphate of atropine is used only for the preparation of its liquor, which is much employed by ophthalmic surgeons, since it is free from alcohol. The extract or ointment of belladonna smeared round the eye may be used for the same purposes as atropine.

Incompatibles.—The caustic fixed alkalies, as potash and soda; when these come in contact with preparations of atropine or belladonna, they destroy their activity by decomposing the atropine.

Homatropinæ Hydrobromas.—Hydrobromate of Homatropine, $C_{16}H_{12}NO_3,HBr$.—This substance is the hydrobromate of an alkaloid prepared from *Tropine* (see p. 281). Tropine

is a body which is produced, in company with tropic acid, by the action of baryta-water upon the alkaloids atropine and hyoscyamine. Tropine and tropic acid may be recombined under certain conditions to form atropine, or tropine may be combined so as to form salts with other acids, such as mandelic or salicylic acid. When these salts are treated with hydrochloric acid they form a class of artificial alkaloids to which the generic name of Tropeines has been given. Homatropine is one of these, produced in this manner from the mandelate of tropine.

Characters and Tests.—A white crystalline powder or aggregation of minute prismatic crystals, soluble in six parts of cold water, and in one hundred and thirty-three of ethylic alcohol. The diluted aqueous solution powerfully dilates the pupil of the eye. Heated on platinum foil it fuses and burns without leaving an appreciable residue. If two minims of chloroform be shaken with ten minims of a ten per cent. aqueous solution and chlorine water be cautiously added, the chloroform will assume a brownish colour. A two per cent. aqueous solution is not precipitated by the cautious addition of solution of ammonia previously diluted with twice its volume of water. About a tenth of a grain moistened with two minims of nitric acid and evaporated to dryness on the water-bath yields a residue which is coloured yellow by an alcoholic solution of potash. If about a tenth of a grain be dissolved in a little water and the solution be made alkaline with ammonia and shaken with chloroform, the separated chloroform will leave on evaporation a residue which will turn yellow, and finally brick-red, when warmed with about fifteen minims of a solution of two grains of perchloride of mercury in a hundred minims of proof spirit.

Dose.—$\frac{1}{50}$ to $\frac{1}{20}$ grain.

Uses.—A solution of hydrobromate of homatropine acts as a speedy local mydriatic (pupil dilator), the pupil returning rapidly to its normal condition; but it is stated to possess none of the poisonous properties of atropine. The pure alkaloid is soluble in oils or 1 in 100 of vaseline. Whilst the effects of atropine last for many days, the patient being disabled from reading and writing, those of homatropine disappear

entirely in twelve or twenty-four hours, the patient suffering from no such disablement. In checking night-sweats, the action of homatropine is considered as inferior to atropine and picrotoxine.

2.—HYOSCYAMUS NIGER. HENBANE.

Hyoscyami Folia.—Henbane Leaves.—The fresh leaves and flowers, with the branches to which they are attached, of Hyoscyamus Niger (fig. 182); also the leaves separated from the branches and flowering tops and carefully dried; collected from biennial plants, wild, or cultivated in Britain, when about two-thirds of the flowers are expanded.

Characters.—Leaves varying in length, sometimes 10 inches long, alternate, exstipulate, oblong, undulated, acute, irregularly toothed, sinuated, pale green and glandular, hairy. The fresh herb has a strong heavy odour, and a bitter, slightly acrid, taste, both of which nearly disappear on drying. The juice, when dropped into the eye, *dilates* the pupil.

Fig. 182.—Hyoscyamus Niger. The Henbane.

All parts of the plant contain a volatile alkaloid, *Hyoscyamine* in combination with *Malic Acid*, and closely allied to atropine. Hyoscyamine is an oily liquid concreting into warty crystals, and having a tobacco-like odour.

Official Preparations.—Extractum Hyoscyami.—Extract of henbane (the fresh leaves, flowering tops, and young branches of henbane). Prepared like the other green extracts. Contained in *Pilula Colocynthidis et Hyoscyami.*

Dose.—5 to 10 grains.

Succus Hyoscyami.—Juice of henbane (fresh leaves, flowering tops, and young branches of henbane; one measure of rectified spirit added to every three measures of the juice).

Dose.—½ fluid drachm to 1 fluid drachm.

Tinctura Hyoscyami.—Tincture of Hyoscyamus (henbane leaves or flowering tops, in No. 20 powder and proof spirit).

Dose.—½ to 1 fluid drachm.

Therapeutics.—Henbane appears to act like stramonium and belladonna; it is, however, much milder, and is chiefly used as a sedative in excited conditions of the nervous system in which opium is unsuitable. It is frequently given to allay irritation of the bladder, to ease pain, to obviate the griping of purgative medicines, to relieve cough, and to relax spasm in numerous diseases. It may be used in the place of belladonna to dilate the pupil. The drug has been observed, when administered internally in large doses, to produce the same symptoms as stramonium and belladonna; viz., dilatation of the pupil and presbyopia, dryness of the fauces and mouth, delirium, eruption on the skin and loss of power over the bladder in cases of slight paraplegia.

Incompatibles.—Caustic fixed alkalies, as soda or potash: these, in contact with henbane preparations, decompose the hyoscyamine, thus destroying their activity.

3.—DATURA STRAMONIUM. THE THORN APPLE.

Stramonii Folia. — Stramonium Leaves. — The dried leaves of Datura Stramonium (fig. 183). Indigenous; growing in waste places and cultivated in Britain.

Fig. 183. Datura Stramonium. The Thorn Apple.

Characters.—Ovate, petiolate, about six inches long, smooth, pointed, unequal at the base, one side decurrent down the petiole, coarsely and sinuately angular-toothed, minutely wrinkled, dark green. The upper surface usually brownish-green, and of a darker shade than the under surface; odour faintly narcotic, taste unpleasant, saline, and bitter.

Stramonii Semina. —Stramonium Seeds.—The dried ripe seeds of Datura Stramonium.

Characters.—About $\frac{1}{6}$ of an inch long, brownish-black, reniform, flattened, wrinkled, and finely pitted ; taste bitterish ; odour disagreeable when bruised.

All parts of the plant contain an alkaloid, *Daturine*, identical with *Atropine*, and united with *Malic Acid*.

Official Preparations.—Extractum Stramonii.—Extract of Stramonium (stramonium seeds, in No. 40 powder ; ether ; distilled water and proof spirit). Prepared by decantation and percolation, and evaporation to a suitable consistence for forming pills.

Dose.—$\frac{1}{4}$ to $\frac{1}{2}$ grain.

Tinctura Stramonii.—Tincture of Stramonium (stramonium seeds, bruised ; proof spirit). Prepared by maceration and percolation.

Dose.—10 to 30 minims.

Therapeutics.—The action of stramonium is apparently identical with that of belladonna. It is supposed to be antispasmodic to the respiratory organs, and has been much employed in asthma, chiefly in the form of smoke from the burning leaf. The extract has been given to control convulsive coughs, and as an anodyne in gastrodynia and other painful affections.

Incompatibles.—Caustic fixed alkalies, as potash and soda, by which the active principle (daturine) is decomposed.

The leaves of Datura Tatula, a plant of the same genus as stramonium, have been frequently employed as a cigarette or in a pipe, for the treatment of spasmodic asthma ; the activity of this plant is in all probability due to the same alkaloid as that contained in stramonium.

4.—NICOTIANA TABACUM. VIRGINIAN TOBACCO.

Tabaci Folia.—Leaf Tobacco.—The dried leaves of Nicotiana Tabacum (fig. 184). Chiefly growing in tropical America.

Characters.—Large leaves, sometimes more than 20 inches long, ovate, or ovate-lanceolate, entire, brittle, glandular, hairy ; when fresh, pale green ; when dry, mottled brown ; having a peculiar heavy, characteristic odour and nauseous bitter acrid

taste. Tobacco yields, when distilled with solution of potash, an alkaline fluid having the peculiar odour of *Nicotina*, and precipitated by perchloride of platinum and tincture of galls. It contains, in addition to nicotine, a concrete volatile oil, *Nicotianin*, or tobacco-camphor. Nicotine is extremely poisonous, and is contained in tobacco smoke. It is stated to cause dilatation of the pupils when given internally. About 6 to 7 per cent. of this alkaloid is contained in Virginian tobacco. The leaves should not be manufactured, since during the process they undergo various chemical changes.

FIG. 184.—Nicotiana Tabacum. The Tobacco Plant.

Therapeutics.—When internally administered, tobacco is a powerful sedative, especially affecting the heart. It frequently causes diuresis, and has been employed in dropsy. It is sometimes followed by dangerous depression, and is therefore very seldom given internally. Externally, tobacco is a powerful irritant; it is occasionally used medicinally in the form of snuff, as an errhine in head affections; also in the form of smoke, as an expectorant and sedative in some varieties of asthma. The frequent use of the drug greatly influences the susceptibility of individuals. It affects some persons and not others. Use establishes tolerance, as in the case of opium.

Caprifoliaceæ.

SAMBUCUS NIGRA. THE ELDER TREE.

Sambuci Flores.—ELDER FLOWERS.—The fresh FLOWERS of Sambucus Nigra (fig. 185). From indigenous plants.

Characters.—Flowers small, white, crowded in five-partite cymes; odour fragrant but somewhat sickly. Taste bitterish. They yield, on distillation, a *volatile oil* to which the odour is due; and contain a hydrocarbon, *Sambucene*, with perhaps a little camphor.

Official Preparation.—AQUA SAMBUCI.—Elder-Flower Water (fresh elder flowers, separated from the stalks (or the flowers preserved while fresh with common salt), mixed with water and distilled).

Dose.—1 fluid ounce to 2 fluid ounces.

Therapeutics.—Elder flowers are gently stimulant; they are used in the form of ointment by heating the flowers in hot lard. The elder-flower water is used as an agreeable vehicle for exhibiting medicines or for lotions.

FIG. 185.—Sambucus Nigra. The Elder Tree.

Cinchonaceæ.

1.—UNCARIA GAMBIER.

Catechu.—CATECHU.—An EXTRACT of the leaves and young shoots of Uncaria Gambier. Prepared at Singapore, and in the islands of the Eastern Archipelago.

Characters.—In cubes or masses varying in size and formed of agglutinated cubes. The separate cubes usually about an inch square on each side; externally reddish-brown, internally pale cinnamon-brown, dry, breaking easily, with a dull earthy fracture. Microscopically showing myriads of minute acicular crystals. Taste bitter and astringent at first, then sweetish; no odour. Entirely soluble in boiling water; the decoction when cool contains no starch.

Catechu consists of *Catechu-tannic* or *Mimo-tannic Acid*, and *Catechin* or *Catechuic Acid*. The former acid gives a *greenish* precipitate with ferric salts, and catechin is converted by alkalies into *Japonic* and *Rubinic Acids*.

Dose.—10 to 30 grains.

Official Preparations.—INFUSUM CATECHU.—Infusion of Catechu (catechu, in coarse powder; cinnamon bark, bruised; infused in boiling distilled water, and strained).

Dose.—1 to 2 fluid ounces.

PULVIS CATECHU COMPOSITUS.—Compound Powder of Catechu (catechu, kino, rhatany root, cinnamon bark, nutmeg —all mixed in powder).

Dose.—20 to 40 grains.

TINCTURA CATECHU.—Tincture of Catechu (catechu, in coarse powder; cinnamon bark, bruised; proof spirit). Prepared by maceration and percolation.

Dose.—$\frac{1}{2}$ to 2 fluid drachms.

TROCHISCI CATECHU.—Catechu Lozenges (catechu, refined sugar, gum acacia (all in powder); mucilage of gum acacia; distilled water). Each lozenge contains one grain of catechu.

Dose.—1 to 6 lozenges.

Therapeutics.—Catechu is a very powerful astringent. It is used chiefly in diarrhœa, and some forms of dyspepsia attended by pyrosis. It may also be employed in hæmorrhages and mucous discharges. Externally it may be used as an ointment. It may be chewed, and the juice swallowed gradually, in relaxed conditions of the throat, and in some forms of hoarseness.

2 (*a*).—CINCHONA; CALISAYA; OFFICINALIS; SUCCIRUBRA; LANCIFOLIA, &c.

Description of Plate.—A, Cinchona Calisaya, fruit-bearing branch (*from a specimen collected in the province of Carabaya, in Peru*); B, Flowers (*natural size*); C, Corolla laid open (*magnified*); D, Capsule (*magnified*); E, Seed (*magnified*); F, Leaf of Cinchona Josephiana (*from a specimen gathered in the province of Yungas, in Bolivia*).

Cinchonæ Cortex.—CINCHONA BARK.—The dried BARK of various Cinchonas from which the peculiar alkaloids of the bark may be obtained, collected in the North Western and Western regions of South America; used in preparing Cinchonidinæ Sulphas, Cinchoninæ Sulphas, Quininæ Hydrochloras, Quininæ Sulphas. The salts of quinine and cinchonine may also be obtained from some species of Remijia.

In India the tree chiefly grown is the Cinchona Succirubra, which contains a large quantity of quinine, and which seems to grow quickly and to thrive better than the Cinchona Calisaya. The Cinchona Officinalis and Cinchona Lancifolia grow well

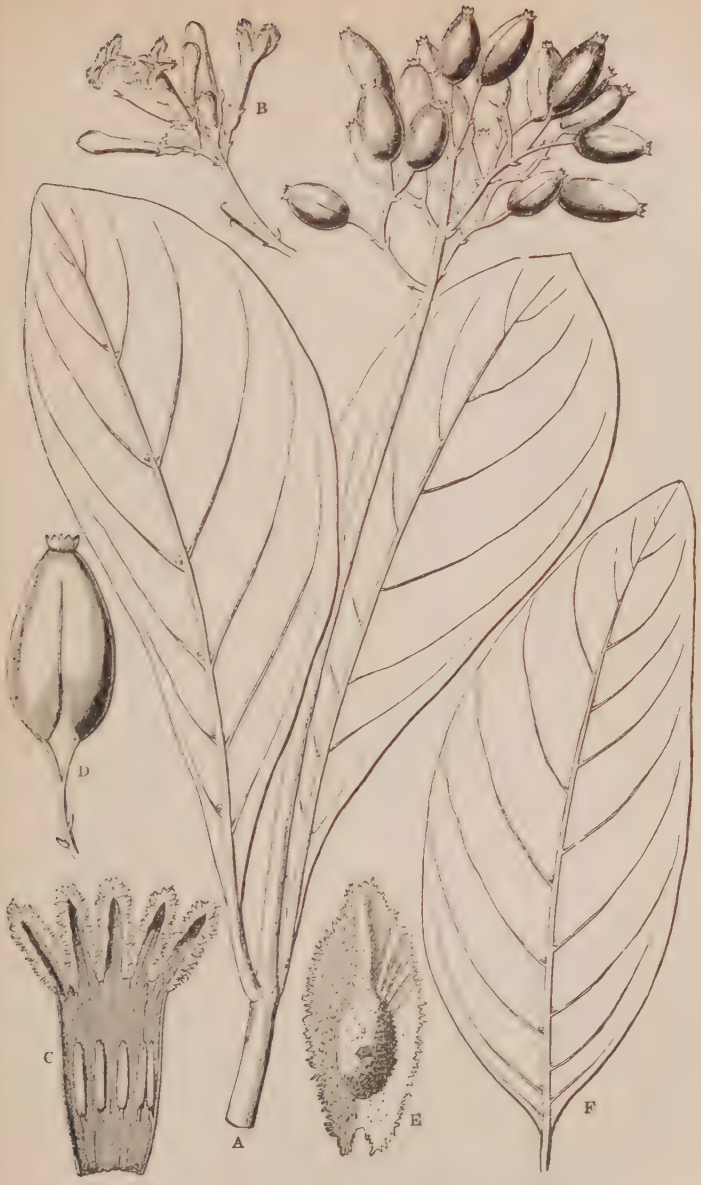


FIG. 186.—Cinchona Calisaya and leaf of Cinchona Josephiana.

at moderate heights, *i.e.* below 6,000 feet ; the barks of these are also very rich in alkaloids, of which nearly one-half is quinine.

The **Cinchona Calisaya** (fig. 186) is a tall tree with obtuse, oblong, obovate, or oblong-lanceolate leaves. Its trunk is straight or bent, naked, not unfrequently twice the thickness of a man's body. The leafy head for the most part is elevated above all the other forest trees. It grows in declivities and steep and rugged places of the mountains, at a height of from 5,000 to 6,000 English feet, in the hottest forests of the valleys of Bolivia and Southern Peru, in the Bolivian provinces of Yungas, and in the Peruvian province of Carabaya. It flowers in April and May. It is the genuine Calisaya or yellow bark of English commerce.

FIG. 187.—Transverse section of the very young bark of Cinchona Ovata, showing the disposition of the layers before their modification by the progress of vegetation.

ep, remains of the epidermis ; *s'*, suberous coat or resinous circle ; *ec*, cellular envelope ; *la*, lacunæ : these, as well as the cells of the cellular envelope, are filled with resinous matters, which require to be removed in order to render the cell-walls obvious ; *l*, liber ; *fl'*, cortical fibres.

The *Cinchona Josephiana*, of which the leaf is shown in fig. 186 F, is a shrub with somewhat acute, oblong-lanceolate or ovate-lanceolate leaves. It is from 6 to 10 feet high, with a slender branched trunk of from 1 to 2 inches thick. Branches erect. Bark adhering firmly to the wood : that of the trunk and branches furnished with various lichens, and marked in an annular manner by some narrow distant cracks, that of the branchlets reddish-brown. The bark of the trunk and branches, and of the stumps of the larger roots, is occasionally imported with the Calisaya or yellow bark.

The bark of young Cinchona stems consists of four parts :

1. The *epidermis* or outer coat, consisting of a row of oblong brownish cells, flattened in the direction from without inwards, and frequently blended with the thallus of lichens.

2. The *epiplœum*, *periderm*, or *suberous coat*, composed of layers of tubular oblong cells, which in some barks constitutes a layer of true cork, but in others consists of a modified cork known as the *resinous circle*.

3. The *mesoplœum*, placed immediately within the suberous coat, and sometimes called the *cellular* or *green layer*. It is

FIG. 188.—Bark of Cinchona Calisaya entirely deprived of periderm. Showing short fibrous fracture of the liber and the digital furrows.

FIG. 189.—Bark of Cinchona Scrobiculata. Showing stringy fracture of the liber.

FIG. 190.—Bark of Cinchona Pubescens coated externally by its periderm. Smooth or suberous fracture of the external or purely cellular portion of the bark. Showing ligneous fracture of the internal portion or liber.

composed of regular cells containing resinous matters. This coat is separated from the liber by *lacunæ* analogous to *laticiferous* vessels, from which, in the fresh bark, a gummy-resinous, rather bitter, astringent fluid escapes.

4. The *endoplœum* or *liber*, the internal tunic composed of pentagonal cells filled with resinous matters, and of woody tissue, forming the *cortical fibres* (see fig. 187).

The character of the **transverse fracture** is of importance in determining the quality of bark. Speaking generally there are two kinds of fracture, viz.—1, the *short* and *smooth*, and

2, the *fibrous* ; of the fibrous fracture there are three varieties, viz. the *short fibrous*, the *stringy*, and the *ligneous* or *woody*. These are shown respectively in the bark of Cinchona Calisaya, Cinchona Scrobiculata, and Cinchona Pubescens (figs. 188–190).

The reason of these peculiarities is to be found in the anatomical structure of the bark as exhibited by the microscope. In the *Calisaya* bark the ligneous fibres are short, fusiform,

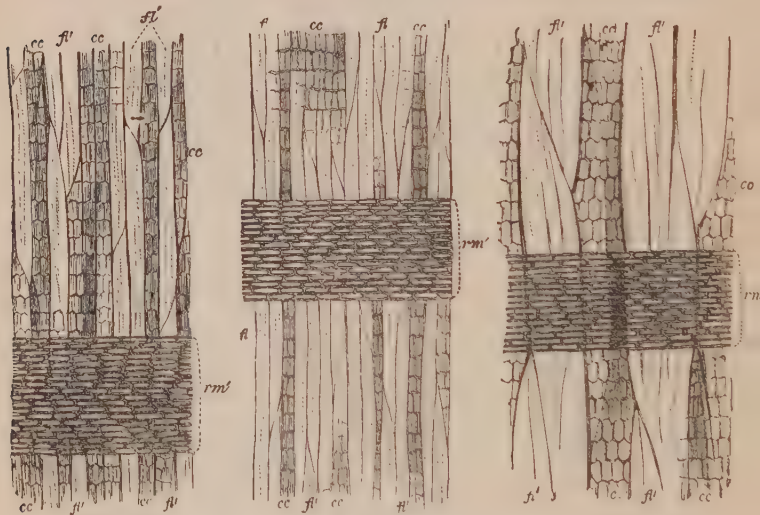


FIG. 191. FIG. 192. FIG. 193.

FIGS. 191–3.—Microscopic structure of the liber of Cinchona Calisaya, Scrobiculata, and Pubescens.

fl', Ligneous fibres ; *cc*, cellular tissue of the liber ; *rm'*, medullary rays. Fig. 191 shows a longitudinal section of a portion of the liber made parallel to the medullary rays.

equal, attached loosely to each other by their oblique ends, and surrounded, for the most part individually, by a cellular tissue filled with resin. In the *Scrobiculata* bark the ligneous fibres are nearly twice as long, more numerous, and adherent by their more tapering extremities. In the *Pubescens* the ligneous fibres are three or four times as large as those of the preceding barks, and are united in bundles ; and, moreover, the internal face of the bark is formed in great part of cellular tissue. (See figs. 191–200.)

FIG. 194.—Cinchona Calisaya. Transverse section of the entire thickness of a piece of bark with a portion of the periderm attached.

FIG. 195.—Calisaya Bark. Transverse section of a portion of liber much more highly magnified than in fig. 194 (see also fig. 191).

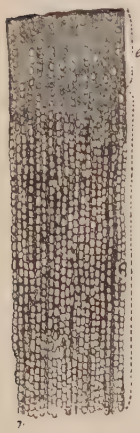


FIG. 196.—Cinchona Scrobiculata.

Microscopic structure of transverse sections of these barks.

c c, cellular tissue of the liber; *ec*, cellular envelope; *fl'*, fibres of the liber (*i.e.* cortical fibres); *rm*, medullary rays; *l*, the liber; *pd*, a portion of the periderm attached to the liber; *s*, suberous coat.

FIG. 197.—Cinchona Pubescens.

FIG. 198.

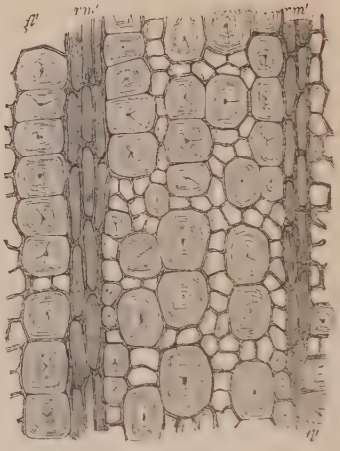


FIG. 199.

FIGS. 198–9.—Microscopic structure of the bark of Cinchona Scrobiculata (see also fig. 196).

Fig. 198 shows the analogy which exists between the extreme layer (*ec*) of this bark and the internal layer of the periderm of the Calisaya bark (fig. 194); *ec*, cellular envelope; *fl'*, ligneous or cortical fibres of the liber; *rm*, medullary rays.

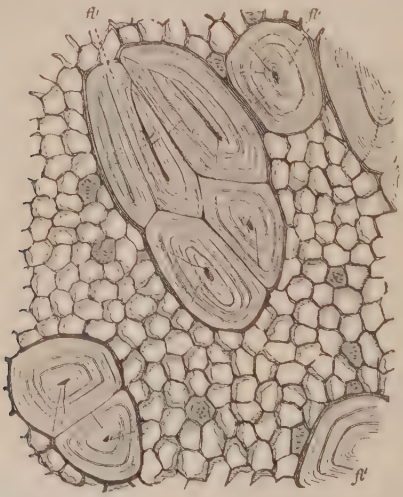


FIG. 200.—Microscopic structure of the bark of Cinchona Pubescens (see also figs. 193 and 197).

Bark Peeling, (fig. 201).—The *Cascarilleros* or bark-peelers gather the bark at all seasons except the rainy season, which in

FIG. 201.—The Valley of St. Juan del Oro. Bark-peeling in the forests of Carabaya in Peru.

duration corresponds with our winter, and the process from first to last occupies a considerable time, sometimes many weeks.

The *Cinchonas* seldom constitute an entire forest, but form more or less compact groups (*manchas*) distributed in different parts of it. Most frequently they grow separately. The tops of the trees first attract the notice of the *cascarillero*; a slight movement peculiar to the leaves of certain species, a particular colour of the foliage, and the aspect produced by a mass of inflorescence, enable him to recognise the cinchonas at a great distance. Under other circumstances he confines his attention to the trunks, of which the external layer of the bark exhibits remarkable characters. In order to strip the tree of its bark it is felled with a hatchet, being cut a little above the root, the bark having been previously removed from this part; the bark is thickest at the base and therefore more profitable.

The tree having been cut down, the external coating or periderm is removed by striking it with the back of the hatchet or with a little wooden mallet. The bark is divided by uniform incisions circumscribing the pieces that are to be removed, and these are then separated from the trunk. The pieces are usually made from 15 to 18 inches long and 4 or 5 wide. The bark of the branches is not deprived of its periderm. In the process of drying, the thinnest pieces of bark from the branches or small trunks, intended to make the *quilled* bark, are simply exposed to the rays of the sun, and they take of themselves the form of a hollow cylinder. The pieces of bark taken from the large trunks, which are to form the *flat* cinchona, are, after exposure to the sun, placed one upon the other in crossed squares like planks of wood in a timber yard, a heavy weight being placed upon the top of the pile.

The Calisaya barks yield from 2·5 to 3·8 per cent. of quinine.

Quininæ Sulphas.—SULPHATE OF QUININE, $((C_{20}H_{24}N_2O_2)_2 H_2SO_4)15H_2O$.—The SULPHATE of an ALKALOID, prepared from the powder of various kinds of Cinchona and Remijia bark by extraction with spirit after lime has been added, or by acting with alkali upon an acidulated aqueous infusion, the alkaloid being subsequently neutralised by sulphuric acid and the resulting salt purified.

The barks contain *Quinina* and *Cinchonina* united to an acid, *Chinic* or *Quinic Acid*, as *Chinate* or *Quinate* of *Quinine* and *Cinchonine*. Upon the addition of *Hydrochloric Acid*, hydrochlorates of these alkaloids are formed; these are then precipitated by a *Solution of Soda*, chloride of sodium being produced. *Sulphuric Acid* is finally added, *Sulphate of Quinine* and *Sulphate of Cinchonine* being formed, the former sulphate separating first.

Tests.—Solutions of quinine present a blue fluorescent appearance; if they are treated first with fresh strong chlorine water, and then with ammonia, a deep *emerald-green* colour is produced, due to the presence of a substance termed *Thalleioquin*.

Dose.—1 to 10 grains.

Official Preparations.—Ferri et Quininæ Citras.—Citrate of Iron and Quinine (solution of persulphate of iron, sulphate of quinine, diluted sulphuric acid, citric acid, solution of ammonia, and distilled water).

Characters.—Thin scales of a greenish golden-yellow colour, somewhat deliquescent, and soluble in cold water. Taste bitter and chalybeate.

Dose.—5 to 10 grains.

Tinctura Quininæ Ammoniata.—Ammoniated Tincture of Quinine (sulphate of quinine, solution of ammonia, and proof spirit: 1 grain of sulphate of quinine in 1 fluid drachm).

Dose.—½ to 2 fluid drachms.

Vinum Quininæ.—Wine of Quinine (sulphate of quinine, citric acid, and orange wine: 1 grain of sulphate of quinine in each fluid ounce).

Dose.—½ to 1 fluid ounce.

Quininæ Hydrochloras.—Hydrochlorate of Quinine, $C_{20}H_{24}N_2O_2HCl$, $2H_2O$.—Obtained from the same sources and by the same process as sulphate of quinine, the separated alkaloid being neutralised by hydrochloric acid.

Characters.—In crystals resembling those of sulphate of quinine, but usually somewhat larger and less soluble.

Dose.—1 to 10 grains. Used in preparing—

TINCTURA QUININÆ.—Tincture of Quinine. Hydrochlorate of quinine is dissolved in tincture of orange peel by the aid of a little heat. The solution is subsequently filtered.

Dose.—½ to 2 fluid drachms.

Cinchonidinæ Sulphas—SULPHATE OF CINCHONIDINE, $(C_{20}H_{24}N_2O)_2H_2SO_4$, $3H_2O$.—This may be obtained from the mother liquors of the crystallisation of sulphate of quinine by further concentration, being then purified by crystallisation from alcohol, and finally from hot water.

Characters and Tests.—In colourless silky crystals, generally acicular, soluble in water. The aqueous solution has a bitter taste, twists a ray of polarised light to the left, and is not distinctly fluorescent when acidified. Dissolves in pure sulphuric acid, producing not more than a faint yellow coloration. Gives a white precipitate with a solution of tartarated soda.

Dose.—1 to 10 grains.

Cinchoninæ Sulphas.—SULPHATE OF CINCHONINE, $(C_{20}H_{24}N_2O)_2H_2SO_4$, $2H_2O$.—May be obtained from the mother liquors of the crystallisation of the sulphates of quinine, cinchonidine, and quinidine, by precipitating the alkaloid with caustic soda, washing it with spirit until free from other alkaloids, dissolving in sulphuric acid, and, after purifying the solution with animal charcoal, allowing the salt to crystallise.

Characters and Tests.—Hard, colourless, short, prismatic crystals, with a vitreous lustre. Soluble in water. The aqueous solution has a bitter taste, and twists a ray of polarised light to the right. The acidified solution is not fluorescent like that of quinine. It dissolves in pure sulphuric acid without change of colour.

Dose.—1 to 10 grains.

2 (*b*).—CINCHONA SUCCIRUBRA.

Cinchonæ Rubræ Cortex.—RED CINCHONA BARK.—The dried BARK of the stem and branches of cultivated plants of Cinchona Succirubra. Cultivated in Java, India, Jamaica, and Ceylon.

Characters.—In quills or incurved pieces, coated with the periderm, varying in length from usually a few inches to two feet, the bark itself from one-tenth to a quarter of an inch thick or rarely more ; outer surface brown or reddish-brown, rugged or wrinkled longitudinally, frequently warty, and crossed by deep transverse cracks ; inner surface brick red or reddish-brown, irregularly and coarsely striated, fracture nearly close in the smaller quills, finely fibrous in the larger ones ; powder brownish, or reddish-brown ; taste bitter and somewhat astringent.

The best red barks should yield 2·6 per cent. of quinine, and 1·5 per cent. of cinchonine.

Among the constituents of Cinchona barks are alkaloids, as Quinina, Quinidina, Cinchonina, Cinchonidina ; and acid principles, as Quinic or Chinic Acid, Quino-tannic Acid, Cinchona-red, Quinovin, Quinovic Acid.

Official Preparations.—Decoctum Cinchonæ.—Decoction of Cinchona (red cinchona bark, in No. 20 powder, boiled with distilled water).

Dose.—1 to 2 fluid ounces.

Extractum Cinchonæ Liquidum. — Liquid Extract of Cinchona (red cinchona bark, in No. 60 powder ; hydrochloric acid ; glycerine ; distilled water ; rectified spirit). Prepared by maceration, percolation, and evaporation ; contains 5 grains of alkaloids of the bark in every 100 fluid grains.

Dose.—5 to 10 minims.

Infusum Cinchonæ Acidum.—Acid Infusion of Cinchona (red cinchona bark, in No. 40 powder, and aromatic sulphuric acid ; boiled with distilled water and strained).

Dose.—1 to 2 fluid ounces.

Tinctura Cinchonæ.—Tincture of Cinchona (red cinchona bark, in No. 40 powder, and proof spirit ; prepared by maceration and percolation).

Dose.—$\frac{1}{2}$ to 2 fluid drachms.

Tinctura Cinchonæ Composita.—Compound Tincture of Cinchona (red cinchona bark, in No. 40 powder ; bitter

orange peel, cut small and bruised ; serpentary rhizome, bruised ; saffron ; cochineal in powder ; and proof spirit).

Dose.—½ to 2 fluid drachms.

Red cinchona bark is also contained in *Mistura Ferri Aromatica.*

Therapeutics of the Cinchona Barks and their Alkaloids.—The CINCHONA BARKS are tonic, antiperiodic, antipyretic (due to the contained alkaloids), and astringent (due to the cinchotannic acid and cinchona red). They are given in fevers, malarious diseases, neuralgias, and debility.

Generally speaking, the bark of the Cinchona Calisaya contains large quantities of quinine ; Cinchona Officinalis of cinchonine ; and Cinchona Succirubra about equal quantities of the two alkaloids. It is in the Carthagena (the red Lancifolia) barks that quinidine and cinchonidine are found more particularly.

Experiments have shown that QUININA is fatal to the lowest forms of vegetable and animal life ; that it exerts a similar inhibitory action on many fermentations, arresting the solvent action of the gastric juice, the action of emulsin upon amygdalin, and the vinous and butyric fermentations ; that it weakens or arrests the spontaneous movements of the white blood corpuscles, and checks their migration from the vessels ; that in large doses it paralyses the heart, causing a sudden fall of blood pressure, convulsions, and death ; that it exerts a powerful sedative action upon the brain and spinal cord, finally abolishing reflex movements ; and lastly, that it lowers the heat of the body in healthy animals.

In medicine Quinine is employed as a *Tonic*, in small doses increasing the appetite and checking the sweating of debility.

As an *Antiperiodic* it is given in agues, miasmatic neuralgia, malarious remittents, splenic and hepatic congestions ; acting as a specific.

It is also exceedingly useful in neuralgias *not* of malarial origin.

As an *Antipyretic.* Doses of 5 to 20 grains notably reduce the temperature in pyrexia, no matter what the origin may be.

It appears to check the tendency to suppuration in acute inflammations of various organs and tissues.

Large doses of Quinina have proved very valuable in certain septic conditions of blood, as in surgical and puerperal septicæmia.

Externally Quinine may be applied as an antiseptic and stimulant to unhealthy ulcers ; it may also be employed as a gargle in putrid sore throat, or as a dentifrice to spongy gums.

Large doses of Quinina produce symptoms of *Quinism* or *Cinchonism*, viz., buzzing in the ears, giddiness, deafness, wakefulness, and occasionally nausea with complete loss of appetite.

Cinchonine and Cinchonidine are tonic and antipyretic, and seem to act like quinine but not so powerfully. They occasion more cardiac depression than when quinine is given.

Adulterations of the Cinchona Barks.—The officinal barks may be substituted by inferior non-officinal cinchonas, and by barks of other kinds than those belonging to the order Cinchonaceæ. Barks, which are rich in quinine, usually contain a considerable amount of calcium, and strong infusions of these are precipitated by sodium sulphate ; this does not take place with the barks by which cinchonine is chiefly yielded.

Adulterations of Quinine Sulphate. Sulphates of Calcium, *Chalk*, and *Magnesium* ; these substances are insoluble in alcohol, and after being heated on platinum foil they leave an ash, the nature of which is detected by the ordinary tests. *Cinchonina*, *Cinchonidina*, and *Quinidina* : ascertained by their different solubilities in water, alcohol, and ether. *Salicin* : yields a *blood-red* colour with sulphuric acid. *Sugars* : a solution of the salt, after the precipitation of the alkaloid by an alkali, has a sweet taste. *Starch* : strikes a *blue* colour with iodine. *Stearic Acid* : insoluble in diluted acids. *Boric Acid* : an alcoholic solution of this acid imparts a *green* tinge to flame.

Certain barks from Columbia, termed "Cuprea barks" (as a source of quinine), have been introduced into commerce. By these an alkaloid *Cupreine* is yielded.

Quininæ Sulphas should not contain more than five per cent. of sulphates of other cinchona alkaloids.

3.—CEPHAËLIS IPECACUANHA.

Ipecacuanha.—IPECACUANHA.—The dried ROOT of Cephaëlis Ipecacuanha (fig. 202). Imported from Brazil, where it chiefly grows, and sent from Rio Janeiro.

FIG. 202. –Cephaëlis Ipecacuanha.

FIG. 203.—Brown Annulated Ipecacuanha Root.
a, ringed portion ; *b*, portion of a root without rings.

FIG. 204.—Striated Ipecacuanha (roots of Psychotria Emetica).
a, an old root with a well-marked intersection ; *b*, contorted root.

Characters.—The Brazilian or Brown *Annulated* Ipecacuanha (fig. 203), so designated in order to distinguish it from the Peruvian or *Striated* (fig. 204), the produce of the

Psychotria Emetica, and the *Undulated*, the Richardsonia Scabra (fig. 205), is in pieces two or four inches long, about the size of a small writing twisted quill, and irregularly annulated. Colour

FIG. 205.—Undulated Ipecacuanha Root.
a, root of Richardsonia Scabra; *b*, root of a Richardsonia.

greyish brown or reddish; fracture resinous or waxy, brown. It consists of two parts, the cortical (containing the active ingredients), and a slender, tough, white woody centre. Powder, pale brown, with a faint peculiar odour and a somewhat acrid and bitter taste.

Contains a feeble alkaloid, *Emetina*, combined with *Cephaelic* or *Ipecacuanhic Acid*; also starch, sugar, gum, and fatty or oily matter.

Dose.—As an *expectorant*, ½ grain to 2 grains; as an *emetic*, 15 grains to 30 grains.

Official Preparations.—ACETUM IPECACUANHÆ.—Vinegar of Ipecacuanha (ipecacuanha, in No. 20 powder, moistened with diluted acetic acid, and macerated; then packed in a percolator, and the acid added gradually until the required volume of the vinegar of ipecacuanha is obtained).

Dose.—5 to 40 minims as an expectorant.

Although medicinally active, this preparation is somewhat unsightly, inelegant, and unstable.

PILULA IPECACUANHÆ CUM SCILLA.—Pill of Ipecacuanha with Squill (compound powder of ipecacuanha; squill, and ammoniacum, in powder; treacle). One part of opium in 23 of the pill mass, nearly.

Dose.—5 to 10 grains.

PULVIS IPECACUANHÆ COMPOSITUS.—Compound Powder of Ipecacuanha (ipecacuanha, opium, and sulphate of potassium mixed in powder). 1 grain of opium and 1 grain of ipecacuanha in 10 grains of the powder.

Dose.—5 to 15 grains.

Trochisci Ipecacuanhæ.—Ipecacuanha Lozenges (ipecacuanha, refined sugar, gum acacia (all in powder), mucilage of gum acacia, distilled water). Each lozenge contains $\frac{1}{4}$ grain of ipecacuanha.

Dose.—1 to 3 lozenges.

Vinum Ipecacuanhæ.—Wine of Ipecacuanha (ipecacuanha, coarsely powdered; macerated in acetic acid and percolated with distilled water, then evaporated to dryness, the residue being powdered and macerated in sherry).

Dose.—As an *expectorant*, 5 to 40 minims; as an *emetic*, 3 to 6 fluid drachms.

Ipecacuanha is also contained in *Pilula Conii Composita*, and *Trochisci Morphinæ et Ipecacuanhæ*.

Therapeutics.—Topically applied, both ipecacuanha and emetina exercise an irritant effect upon mucous membranes and raw surfaces. After being injected hypodermically, emetina has produced vomiting in the lower animals. The pulse is lowered under its influence, and the muscular spasm induced by strychnine becomes relaxed. Given in medicinal doses ipecacuanha acts as an emetic, but it is not so speedy in its action as mustard or sulphate of zinc. In small doses the drug becomes absorbed and acts upon the various mucous membranes, especially those of the alimentary canal and respiratory passages, and it is therefore expectorant; it is also sometimes laxative and diaphoretic. Ipecacuanha is very useful as an emetic in chest and throat affections accompanied by fever, as in bronchitis, phthisis, and also in diphtheria, in which the *after-expectorant* effect proves very serviceable: it may also be given to unload the stomach in some forms of dyspepsia. It may be administered as an *expectorant* in all forms of bronchial disease; and it is of great value in diarrhœa and chronic dysentery, *in consequence of its action upon the alimentary canal.* In acute dysentery of the tropics it is considered a specific: large doses are given at intervals of 8-10 hours. In catarrhal affections it is frequently given as a *diaphoretic* in the form of Dover's powder. When combined with opium its sudorific action seems to be increased.

Some persons are peculiarly susceptible to ipecacuanha,

and in others the effluvia from the powdered drug will establish coughing, sneezing, and a species of asthma.

Adulterations.—Peruvian or *Striated* ipecacuanha, the produce of Psychotria Emetica, the *Undulated*, the Richard-

Fig. 206.—Root of Ionidium Ipecacuanha.

sonia Scabra, and other roots, as the Ionidium Ipecacuanha (fig. 206). This last-mentioned root is a native of the Brazils, belongs to the natural order *Violaceæ*, and is termed False Brazilian Ipecacuanha. It possesses emetic properties. With almond meal Ipecacuanha is also sometimes largely adulterated.

Coffea Arabica also belongs to the Cinchonaceæ, and yields the alkaloid *Caffeine.*

Compositæ.

1.—ANTHEMIS NOBILIS. THE COMMON CHAMOMILE.

Anthemidis Flores.—Chamomile Flowers.—The dried single and double flower-heads or capitula of Anthemis Nobilis (fig. 207). From indigenous cultivated plants.

Characters.—The single variety consists of both yellow (flowers of the disc) tubular, and white (flowers of the ray) strap-shaped florets; the double, of white ligulate (strap-shaped) florets only; all arising from a conical scaly receptacle; both varieties, but especially the single, are very bitter and strongly aromatic. They contain a bitter extractive principle and a *volatile oil*, stated to be a mixture of *Butylic* and *Amylic Angelate* and *Valerate*; and when this oil is heated with

caustic potash, *Potassium Angelate* is formed, which upon the addition of sulphuric acid yields *Angelic Acid.*

Official Preparations.—Extractum Anthemidis.—Extract

Fig. 207.—Anthemis Nobilis. The Chamomile.

of Chamomile (chamomile flowers boiled with distilled water, oil of chamomile being subsequently added).

Dose.—2 to 10 grains.

Infusum Anthemidis.—Infusion of Chamomile (chamomile flowers and boiling distilled water).

Dose.—1 to 4 fluid ounces.

Anthemidis Oleum.—Oil of Chamomile.—The oil distilled in Britain from Chamomile Flowers.

Characters.—Pale-blue or greenish-blue, but gradually becoming yellowish-brown ; with the peculiar odour and aromatic taste of the flowers. Contained in *Extractum Anthemidis.*

Therapeutics.—An aromatic stomachic and tonic ; in large doses (especially the warm infusion) the Chamomile is emetic ; given in dyspepsia, and to assist the action of emetics. The oil is carminative and stimulant, and is a very useful adjunct to purgatives.

2.—ARNICA MONTANA.

Arnicæ Rhizoma.—Arnica Root.—The dried rhizome and rootlets of Arnica Montana (fig. 208). Collected in the mountainous parts of Middle and Southern Europe.

Characters.—Rhizome from one to three inches long, and from one-sixth to a quarter of an inch in diameter, cylindrical, contorted, rough from the scars of the fallen leaves, giving off from the under surface numerous filiform dark-brown wiry rootlets; taste acrid and bitterish, and odour peculiar and somewhat aromatic. Contains *Arnicin*, a bitter principle identical with Cytisin; a yellowish volatile oil and a volatile alkaloid resembling Lobelina have also been obtained from it.

Fig. 208.—Arnica Montana.

Official Preparation.—Tinctura Arnicæ. Tincture of Arnica (arnica root, in No. 40 powder, and rectified spirit; prepared by maceration and percolation).

Dose.—½ to 1 fluid drachm.

Therapeutics.—When internally administered, arnica is an irritant and stimulant. It is supposed to act upon the spinal cord, and it has been given in nervous headache and for chronic rheumatic pains. It is chiefly used as an external application for bruises and sprains, and for the dispersion of tumours, but its virtues are very questionable. The tincture may be used either alone or diluted with water; it is occasionally added to liniments.

3.—LACTUCA VIROSA. THE WILD LETTUCE.

Lactuca.—Lettuce.—The flowering herb of Lactuca Virosa Indigenous. The concrete juice of this plant is called *Lactucarium*: this is obtained by pressing out the juice from the flowering herbs, and afterwards inspissating it with a gentle heat. It occurs in brown masses or lumps which have a bitter taste and an opium-like odour, and is known as *Thridace*, or *Lettuce-Opium*. It yields to alcohol a bitter extractive matter, and a crystalline substance, *Lactucone*; also *Lactucin* and *Lactucic Acid*.

Official Preparation.—Extractum Lactucæ.—Extract of Lettuce (the flowering herb of lettuce: prepared like all the green extracts).

Dose.—5 to 15 grains.

Therapeutics.—The lettuce has been stated to possess some narcotic powers and it has been occasionally eaten at bed-time to procure sleep. Lactucarium and the extract of lettuce have been given to induce sleep and relieve cough when opium is not well borne. 30 grains and more of good lactucarium have been given, the dose having been repeated every four hours, and no decided narcotic effect has followed.

4.—ANACYCLUS PYRETHRUM. THE PELLITORY OF SPAIN.

Pyrethri Radix.—Pellitory Root.—The dried root of Anacyclus Pyrethrum (fig. 209). Imported from the Levant. Growing in Barbary and Spain.

Fig. 209.—Anacyclus Pyrethrum. The Pellitory.

Characters. — Cylindrical, unbranched, somewhat tapering pieces about the length and thickness of the little finger, covered with a thickish, brown, shrivelled bark, studded with black shining points, which are receptacles of resin. Breaks with a close fracture, which presents a radiated appearance. Inodorous. When chewed, it excites a pricking and burning sensation on the lips and tongue. Contains at least two resins, one, *Pyrethric Acid* or *Pyrethrin*, together with a yellow acrid oil, tannin, and colouring matter.

Official Preparation.—Tinctura Pyrethri.—Tincture of Pellitory (pellitory root, in No. 40 powder, and rectified spirit; prepared by maceration and subsequent percolation).

Dose.—15 minims to 1 fluid drachm.

Therapeutics.—Pyrethrum is a topical irritant, creating a pricking sensation in the mouth and a flow of buccal mucus and saliva. It is employed in relaxed throat and in aphonia, as a local stimulant in toothache, and as a masticatory in paralysis of parts about the mouth.

The pellitory is not used internally, but the tincture, diluted with water, is employed as a gargle.

5.—ARTEMISIA MARITIMA OR STECHMANNIANA. THE WORM SEED.

Santonica.—SANTONICA.—The dried unexpanded FLOWER-HEADS or capitula of Artemisia Maritima or Stechmanniana (fig. 210). Imported from Russia.

Characters. — Flower-heads about one-tenth of an inch in length, oblong, ovoid, obtuse, fusiform, pale greenish-brown, nearly smooth ; resembling seeds in appearance, but consisting of from 12 to 18 imbricated involucral scales with a broad thick yellowish-green midrib, enclosing three to five tubular florets ; odour strong, taste bitter, camphoraceous. Contain a *volatile oil* consisting chiefly of *Cinebene Camphor.*

FIG. 210.—Artemisia Maritima or Stechmanniana. The Worm Seed.

Dose.—10 to 60 grains.

The most important constituent of Santonica, and which it contains in the proportion of 1½ to 2 per cent., is

Santoninum.—SANTONIN, $C_{15}H_{18}O_3$.—A crystalline principle, prepared from Santonica (santonica, bruised ; slaked lime ; hydrochloric acid ; solution of ammonia ; rectified spirit ; purified animal charcoal ; distilled water).

The Santonica is bruised with slaked lime and water to form *Santonate of Calcium.* To this hydrochloric acid is added, *Chloride of Calcium* being formed and *Santoninum* thrown down. The precipitate is washed with water, and ammonia added to free it from acid ; *Animal Charcoal* is added to destroy any colouring matter, and the *Santonin* is dissolved out by boiling spirit. Is then set aside to crystallise in the dark, and preserved in bottles protected from the light, in order that the crystals shall not become yellow.

Characters.—Colourless, flat rhombic prisms, feebly bitter, fusible and sublimable when gently heated ; scarcely soluble in cold water, sparingly in boiling water, but abundantly so in chloroform and boiling rectified spirit. Sunlight renders it yellow ; when added to warm alcoholic solution of potash it gives a violet red colour ; not dissolved by diluted mineral acids.

Dose.—2 to 6 grains.

Official Preparation.—TROCHISCI SANTONINI.—Santonin Lozenges (Santonin ; refined sugar and gum acacia in powder ; mucilage of gum acacia and distilled water). 1 grain of santonin in each lozenge.

Therapeutics.—When Santonin is internally administered, Xanthopsy (yellow vision) is occasioned. This result is due to some specific influence either upon the visual centre of the brain or upon the retina. The sensibility of the retina for violet rays appears to be first stimulated and then blunted.

In large doses, giddiness, vomiting, headache, convulsions, and even death have been occasioned. A dose of 3 grains will stain the urine *yellow* ; and urine which has been rendered *yellow* by the internal administration of Santonin, changes to a *bright crimson* colour on the addition of liquor potassæ.

Santonica itself is seldom used, but santoninum is employed as an anthelmintic especially suitable for children. It destroys the round worm (ascaris lumbricoides), but is useless against the thread-worm (oxyuris vermicularis) and the tape-worm (tænia solium). It should be followed by some mild purgative.

Adulterations of Santonin.—Gum—this may be detected by its solubility in water—and boric acid, of which an alcoholic solution burns with a green flame.

6.—TARAXACUM OFFICINALE. THE DANDELION.

Taraxaci Radix.—DANDELION ROOT.—The fresh and dried ROOTS of Taraxacum Officinale. Collected in the autumn from indigenous plants.

Characters and Tests.—Root, if fresh, often a foot or more in length, and half an inch or more in diameter, smooth and yellowish-brown externally, whitish within ; breaks with a short fracture, giving out an inodorous bitter milky juice.

Official Preparations.—DECOCTUM TARAXACI.—Decoction of Dandelion (dried dandelion root, sliced and bruised, then boiled with distilled water and strained).

Dose.—2 to 4 fluid ounces.

Extractum Taraxaci.—Extract of Dandelion (fresh dandelion root; prepared like other green extracts).

Dose.—5 to 30 grains.

Extractum Taraxaci Liquidum.—Liquid Extract of Dandelion (dry dandelion root, in No. 20 powder; proof spirit and distilled water).

Dose.—½ to 2 fluid drachms.

Succus Taraxaci.—Juice of Dandelion (fresh dandelion root and rectified spirit; 1 measure of spirit is added to every 3 measures of juice). This juice contains resinous matter, sugar, gum, and a bitter extractive, from which *Taraxacin*, a crystalline principle, has been obtained.

Dose.—1 to 2 fluid drachms.

Therapeutics.—Taraxacum is said to act specifically upon the liver, increasing and modifying its secretion. It is generally given in combination with a purgative in the treatment of dropsies due to hepatic obstruction. Its value, however, as a remedy is doubtful. Upon some persons it produces a marked diuretic action.

Convolvulaceæ.

1.—IPOMŒA PURGA.

Jalap.—Jalap.—The dried tubercules of Ipomœa Purga (figs. 211, 212). Imported from Mexico; named from the city Xalapa.

Fig. 211.—Ipomœa Purga. Jalap.

Characters.—Ovoid, napiform, rarely fusiform, hard, compact; varying from the size of a nut to that of an orange, the larger tubercules frequently incised or cut into halves or

quarters, covered with a thin brown wrinkled cuticle; presenting, when cut, a dirty yellowish or brownish colour, frequently marked with dark-brown concentric circles. Odour peculiar, faint and smoky; taste sweetish, acrid and nauseous; contains not less than 10 per cent. of resin.

Dose.—10 to 30 grains.

Official Preparations.—Extractum Jalapæ.—Extract of Jalap (jalap, in coarse powder, is added to rectified spirit, and then to distilled water). The tincture and watery solution are evaporated separately to a soft state, and afterwards mixed together, the whole being evaporated—temperature not exceeding 140° Fahr. (60° C.)—to a suitable consistency for forming pills.

Dose.—5 to 15 grains.

Pulvis Jalapæ Compositus.—Compound Powder of Jalap (jalap, in powder; acid tartrate of potassium; ginger, in powder).

Dose.—20 to 60 grains.

Tinctura Jalapæ.—Tincture of Jalap (jalap, in No. 40 powder; proof spirit). Prepared by maceration and percolation.

Dose.—½ to 2 fluid drachms.

Jalap, in powder, is also contained in *Pulvis Scammonii Compositus.*

Jalapæ Resina.—Resin of Jalap.—Jalap, in No. 40 powder; rectified spirit and distilled water.

Characters and Tests.—In dark-brown opaque fragments, translucent at the edges, brittle, breaking with a resinous fracture, readily reduced to a pale-brown powder, sweetish in odour, acrid in the throat, easily soluble in rectified spirit, insoluble in oil of turpentine. Is known in commerce as *Jalapin*, and consists of *Convolvulin* or *Rhodeoretin*, the strongly purgative constituent, and *Jalapic Acid.* Convolvulin is converted by alkalies into *Convolvulic Acid*, and by nitric acid into *Oxalic Acid* and *Ipomœic Acid.* Jalap Resin is not readily miscible with milk.

Dose.—2 to 5 grains.

Jalap Resin is contained in *Pilula Scammonii Composita.*

Therapeutics.—This substance is a brisk purgative, inducing watery discharge. It is much allied to scammony, but is less

irritant ; it apparently acts more upon the small than the large intestines. It is given as an ordinary purgative in costiveness, and in dropsies as a hydragogue, especially when combined with calomel or acid tartrate of potassium. It has little taste,

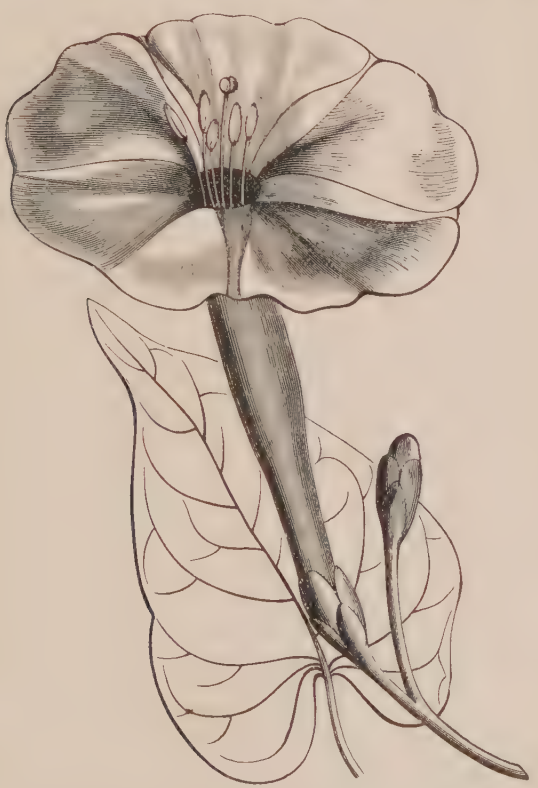


FIG. 212.—Ipomœa Purga. The Jalap. The flower and leaf.

and is therefore a convenient purgative for children, and is frequently employed as a vermifuge.

Adulterations.—Other roots, as that of *Ipomœa Orizabensis*, and others from which the characters of true jalap are absent.

2.—CONVOLVULUS SCAMMONIA.

Scammoniæ Radix.—Scammony Root.—The dried root of Convolvulus Scammonia (figs. 213, 214). Exported chiefly from Smyrna; growing in Syria and Asia Minor.

Fig. 213.—Convolvulus Scammonia. *a*, the root; *b*, flower and leaf.

Characters.—Tap-shaped roots, sometimes three inches in diameter at the top; furrowed longitudinally, and somewhat shrivelled, greyish-brown or yellowish externally, pale brown or whitish within, having a faint odour and taste somewhat like jalap. Rectified spirit agitated with the powder and evaporated leaves a residue having the properties of scammony resin. Consists chiefly of the resin *Jalapin* and gum.

Dose, in powder.—5 to 10 grains.

Scammoniæ Resina.—Resin of Scammony.—(Scammony root, in coarse powder; rectified spirit and distilled water.) Prepared by maceration and percolation, washing and drying.

Dose.—3 to 8 grains.

Characters.—In brownish translucent pieces, brittle, resinous in fracture, of a sweet fragrant odour if prepared from the root. It cannot form singly an emulsion with water, thus distinguishing it from the gum resin (scammonium). Its tincture does not render the fresh-cut surface of a potato blue, showing the absence of guaiacum resin.

Official Preparations.—Confectio Scammonii.—Confection of Scammony (resin of scammony, in powder; ginger, in fine powder; oil of caraway; oil of cloves; syrup; clarified honey).

Dose.—10 to 30 grains.

Pilula Scammonii Composita.—Compound Scammony Pill (resin of scammony; resin of jalap; curd soap, in powder; strong tincture of ginger; rectified spirit). The only official aperient pill in which there is no aloes.

Dose.—5 to 15 grains.

Scammony resin is also contained in *Extractum Colocynthidis Compositum*, and *Pilula Colocynthidis Composita*.

Pulvis Scammonii Compositus.—Compound Powder of Scammony (scammony resin, jalap, and ginger—all in powder).

Dose.—10 to 20 grains.

The chief constituent of this resin is a glucoside identical with *Jalapin*, allied to *Convolvulin*, and termed

Scammonium.—Scammony.—A gum-resinous exudation obtained by incision from the living root of Convolvulus Scammonia, hardened in the air.

Characters and Tests.—Flattish irregular cakes varying in size, ash-grey and rough externally; sometimes sprinkled with a greyish-white powder; fresh fracture resinous, shining, black when dry; odour and flavour cheesy; causes, when chewed, a slight pricking sensation in the back of the throat; easily triturated into a dirty-grey powder, and so converted by water into a smooth emulsion. Contains no starch.

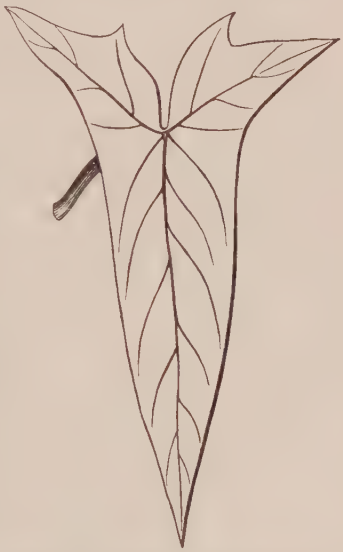


Fig. 214.—Leaf of Convolvulus Scammonia.

Dose.—5 to 10 grains.

Official Preparations.—Mistura Scammonii.—Scammony Mixture (scammony in powder, triturated with milk so as to form a uniform emulsion). Should be made as required.

Dose.—1 to 3 fluid ounces (for a child).

Therapeutics.—Scammony is a drastic purgative, usually causing much watery discharge, and frequently griping; it is used in constipation, in cerebral and dropsical effusions, and as a vermifuge for children.

Adulterations.—Scammony is mostly adulterated with *chalk, flour, and other resins* as guaiacum; sometimes the drug contains only a small percentage of real scammony.

Ericaceæ.

ARCTOSTAPHYLOS UVA-URSI. THE BEARBERRY, WHORTLEBERRY, OR TRAILING ARBUTUS.

Uvæ Ursi Folia.—Bearberry Leaves.—The dried leaves of Arctostaphylos Uva-Ursi (fig. 215). From indigenous plants.

Fig. 215.—Arctostaphylos Uva-Ursi. The Bearberry.

Characters.—Obovate or spathulate entire and slightly revolute coriaceous shining leaves, about three-fourths of an inch in length, minutely reticulated beneath, with a strong astringent taste, and a feeble tea-like odour when powdered; leaves not dotted beneath, nor toothed on the margin. Contain Gallic and Tannic Acids, and two crystallisable principles, *Ursone* ($C_{20}H_{32}O_2$) and *Arbutin* ($C_{12}H_{16}O_7$), with bitter extractive, &c.

Dose, in powder.—10 to 30 grains.

Official Preparation.—Infusum Uvæ Ursi.—Infusion of Bearberry (bearberry leaves, bruised, and boiling distilled water).

Dose.—1 to 2 fluid ounces.

Therapeutics.—A diuretic and astringent, given in urethral and vesical affections, as chronic catarrh of the bladder, to diminish mucous discharges and irritability; uva ursi may also be used for gleets, and may be administered with acids or alkalies.

Adulterations.—The leaves of *Vaccinium Vitis Idæa* or *Red Whortleberry*, which are known by their being dotted, not reticulated, on the under surface; also the common *Box* leaves, which are devoid of astringency.

Gentianaceæ.

1.—OPHELIA CHIRATA. CHIRETTA.

Chirata.—Chiretta.—The dried plant, Ophelia Chirata. Collected in Northern India when the fruit begins to form.

The *Ophelia Corymbosa* is shown in fig. 216.

Characters.—The root is usually two or three inches in length, and unbranched. Stem about three feet long, of the thickness of a goose-quill, smooth, rounded below, slightly quadrangular above, orange-brown or purplish, branched dichotomously; branches opposite, leaves ovate, 5–7 ribbed; flowers small, numerous, panicled; the whole plant intensely bitter.

FIG. 216.—Ophelia Corymbosa.

Contains a bitter resinous substance, *Chiratin*, and *Ophelic Acid*.

Official Preparations.—INFUSUM CHIRATÆ.—Infusion of Chiretta (chiretta, cut small, and distilled water, at 120° Fahr.).

Dose.—1 to 2 fluid ounces.

TINCTURA CHIRATÆ.—Tincture of Chiretta (chiretta, cut small and bruised, and proof spirit). Prepared by maceration and percolation.

Dose.—½ to 2 fluid drachms.

Therapeutics.—A pure bitter tonic, acting exactly like gentian.

2.—GENTIANA LUTEA. THE YELLOW GENTIAN.

Gentianæ Radix.—GENTIAN ROOT.—The dried ROOT of Gentiana Lutea. Imported from Marseilles and other French ports. Grows chiefly in the European Alps and Pyrenees.

The *Purple Gentian* (the *Gentiana Purpurea*) is shown in fig. 217.

Characters.—Cylindrical pieces or longitudinal slices, from half an inch to one inch in thickness, several inches in length, often twisted, much wrinkled, or marked with close transverse rings; deep yellowish-brown externally, yellowish or reddish yellow within, tough and spongy; taste at first sweetish, afterwards very bitter; odour heavy and peculiar.

Contains *Gentianic Acid*, and a crystalline bitter principle, *Gentio-Picrin*; but no starch or tannic acid, and is therefore compatible with salts of iron.

Dose, in powder.—10 to 30 grains.

Official Preparations.—Extractum Gentianæ.—Extract of Gentian (gentian root, sliced ; boiling distilled water). Prepared by maceration and subsequent decoction, being then reduced by evaporation to a proper consistence for making pills.

Fig. 217.—Gentiana Purpurea.

Dose.—2 to 10 grains.

Infusum Gentianæ Compositum.—Compound Infusion of Gentian (gentian root sliced ; bitter orange peel, cut small ; fresh lemon peel, cut small ; boiling distilled water).

Dose.—1 to 2 fluid ounces.

Tinctura Gentianæ Composita.—Compound Tincture of Gentian (gentian root and bitter orange peel, cut small and bruised ; cardamom seeds, bruised ; proof spirit). Prepared by maceration and percolation.

Dose.—½ to 2 fluid drachms.

Therapeutics.—A simple bitter stomachic tonic, useful in convalescence from acute disease, in certain forms of dyspepsia, and in debility generally. It improves the appetite and gives tone to the stomach, and is specially suitable for old persons, in whom quinine sometimes fails.

Other plants belonging to the order Gentianaceæ, viz. *Menyanthes Trifoliata*, the common Buckbean, and *Erythræa Centaurium*, the common Centaury, which contain a similar bitter principle to gentian, have been employed occasionally in the place of the latter root.

Labiatæ.

1.—LAVANDULA VERA. THE TRUE OR COMMON LAVENDER.

Lavandulæ Oleum.—Oil of Lavender.—The oil distilled in Britain from the flowers of Lavandula Vera. Native of Southern Europe, much cultivated in Surrey.

Characters.—Colourless or pale-yellow, with the odour of lavender flowers, and a hot, bitter, aromatic taste.

Dose.—1 to 4 minims.

This oil is a hydrocarbon ($C_{10}H_{16}$), and when oxidised yields a camphor $C_{10}H_{16}O$.

Official Preparations.—SPIRITUS LAVANDULÆ.—Spirit of Lavender (oil of lavender and rectified spirit).

Dose.—½ to 1 fluid drachm.

TINCTURA LAVANDULÆ COMPOSITA.—Compound Tincture of Lavender (oil of lavender; oil of rosemary; cinnamon bark; nutmeg, bruised; red sandal-wood; rectified spirit) prepared by maceration; used in preparing *Liquor Arsenicalis.*

FIG. 218.
A Bilabiate Flower.

Dose.—½ to 2 fluid drachms.

Oil of Lavender is also contained in *Linimentum Camphoræ Compositum.*

A bilabiate flower is shown in fig. 218.

Therapeutics.—The lavender oil is stimulant and carminative; it is used in colic and flatulence, and also in hypochondriasis, hysteria, and other nervous affections.

Adulterations.—The oil of spike (*Lavandula Spica* or *French lavender*) is sometimes mixed with or substituted for the true oil; oil of turpentine is also mixed with it.

2.—MENTHA PIPERITA. PEPPERMINT.

Menthæ Piperitæ Oleum.—OIL OF PEPPERMINT.—The OIL distilled in Britain from fresh flowering peppermint, Mentha Piperita (fig. 219). It grows in damp places.

Characters.—Colourless, pale-yellow, or greenish-yellow when recent, becoming gradually thicker and reddish by age; with the odour of peppermint. Taste warm, penetrating, aromatic, and succeeded by a sensation of coldness in the mouth.

Contains *Menthylic Alcohol* and *Menthol* or *Peppermint-Camphor* ($C_{10}H_{20}O$).

Dose.—1 to 5 minims.

Official Preparations.—Aqua Menthæ Piperitæ.—Peppermint Water (oil of peppermint, mixed with water, and distilled).

Dose.—1 to 2 fluid ounces.

Used in preparing *Mistura Ferri Aromatica.*

Fig. 219.—Mentha Piperita. The Peppermint.

Essentia Menthæ Piperitæ.—Essence of Peppermint (oil of peppermint and rectified spirit). = (1 in 5).

Dose.—10 to 20 minims.

Spiritus Menthæ Piperitæ.—Spirit of Peppermint (oil of peppermint and rectified spirit). = (1 in 50).

Dose.—½ to 1 fluid drachm.

Oil of peppermint is also contained in *Pilula Rhei Composita* and *Tinctura Chloroformi et Morphinæ.*

Therapeutics.—Peppermint is carminative and stimulant; it is employed as an adjunct to purgatives, and to relieve flatulence.

3.—MENTHA ARVENSIS; PIPERASCENS ET GLABRATA; PIPERITA.

Menthol.—Menthol, $C_{10}H_{20}O$.—A stearoptene (concrete volatile oil) obtained by cooling the oil distilled from the fresh herb of Mentha Arvensis, Mentha Piperascens et Glabrata, and of Mentha Piperita.

Characters and Tests.—Colourless acicular crystals, generally more or less moist from adhering oil; or in fused crystalline masses. Hardest masses do not melt below 108° Fahr. (42·2° C.). Having the flavour and odour of peppermint, causing warmth on the tongue, and, if air is inhaled, a sensation of coolness. Sparingly soluble in water, readily so in rectified spirit; when boiled with sulphuric acid diluted with half its volume of water, menthol acquires an indigo blue or ultramarine colour, the acid becoming brown. Should be completely dissipated by the heat of a water-bath.

Dose.—½ to 2 grains.

Official Preparation.—Emplastrum Menthol.—Menthol

Plaster.—Yellow wax and resin are melted together, and, as the mixture cools, menthol is stirred in until dissolved.

Therapeutics.—This substance is an antiseptic ; it is chiefly used as a local anæsthetic, especially in facial neuralgia, pleurodynia, and sciatica. It may be applied in the form of sticks, which are rubbed gently over the painful part, or as an alcoholic solution. Occasionally it has been administered internally as a diffusible stimulant.

4.—MENTHA VIRIDIS. SPEARMINT.

Menthæ Viridis Oleum.—Oil of Spearmint.—The oil distilled in Britain from fresh flowering spearmint, Mentha Viridis. Grows in marshy places.

Characters.—Colourless or pale-yellow, with the odour and taste of the herb spearmint. Consists of a hydrocarbon identical with oil of turpentine and containing a camphor in solution.

Dose.—1 to 4 minims.

Official Preparation.—Aqua Menthæ Viridis.—Spearmint Water (Oil of spearmint mixed with water and distilled).

Dose.—1 to 2 fluid ounces.

Therapeutics.—Exactly the same as Peppermint.

5.—ROSMARINUS OFFICINALIS. ROSEMARY.

Rosmarini Oleum.—Oil of Rosemary.—The oil distilled from the flowering tops of Rosmarinus Officinalis (fig. 220). Chiefly growing on the hills in the southern countries of Europe.

Fig. 220.—Rosmarinus Officinalis. The Rosemary.

Characters.—Colourless or pale-yellow, with the odour of rosemary, and a warm aromatic taste.

Consists of an oxidised oil or hydrocarbon in which a species of camphor is contained.

Official Preparation.—Spiritus Rosmarini.—Spirit of Rosemary (oil of rosemary and rectified spirit). = (1 in 50).

Dose.—1 to 5 minims.

Oil of rosemary is also contained in *Linimentum Saponis* and *Tinctura Lavandulæ Composita.*

Therapeutics.—Rosemary is powerfully stimulant; it is given in nervous headache and hysteria; and is used externally for its odour, and for its rubefacient action.

6.—THYMUS VULGARIS, GARDEN THYME; MONARDA PUNCTATA, HORSEMINT; CARUM AJOWAN.

Thymol.—THYMOL, $C_{10}H_{13}HO$.—A STEAROPTENE (concrete volatile oil) obtained from the volatile oils of the Thymus Vulgaris, Monarda Punctata, and Carum Ajowan by saponifying with caustic soda and treating the separated soap with hydrochloric acid, or from a distilled fraction of the oil by exposure at a low temperature. It may be purified by re-crystallisation from alcohol.

Characters and Tests.—Large oblique prismatic crystals having the odour of thyme and an aromatic pungent flavour. The crystals sink in cold water, but upon heating the mixture to 110°–125° Fahr. (43·3° to 51·7° C.) they melt and rise to the surface. Slightly soluble in cold water, freely soluble in solutions of alkalies and in alcohol and ether. The crystals volatilise entirely at the temperature of a water-bath. A solution of thymol in half its bulk of glacial acetic acid when warmed with an equal volume of sulphuric acid acquires a reddish-violet colour.

Dose.—$\frac{1}{2}$ to 2 grains, administered in an alcoholic solution.

Therapeutics.—This substance is a powerful antiseptic, more so than carbolic or salicylic acid. It is used as a spray or as an antiseptic dressing, and, in consequence of its mild caustic action, has been advocated in the treatment of ringworm, psoriasis, and eczema. It has also been given in typhoid fever and in diphtheria.

When essential oils are cooled slowly many of them become separated into a fluid and a solid portion, to which the names *Elæopten* and *Stearopten* have been applied respectively. This result takes place from the circumstance that essential oils are mixtures of two or more distinct chemical compounds which

differ in fusibility and volatility. One of these substances usually contains no oxygen, but the others are often substances that are produced from it by oxidation. Of these the pure hydrocarbon is generally the more volatile, and it acts as a solvent to the oxidised compounds; the latter, by a depression of temperature, may often be separated from it in a crystallised form. Most of the essential oils possess a yellowish colour, which deepens upon exposure to air, and during this exposure oxygen is absorbed with more or less rapidity; by this means they become converted gradually into a solid resinous or camphorous mass. The most powerful odour is usually possessed by those oils which absorb oxygen the most rapidly.

Lobeliaceæ.

LOBELIA INFLATA. INDIAN TOBACCO.

Lobelia.—LOBELIA.—The dried FLOWERING HERB of Lobelia Inflata (fig. 221). Imported from North America. Indigenous in the United States.

Characters.—The entire herb is official. Stem angular; leaves alternate, ovate, toothed, somewhat hairy beneath; capsule ovoid, inflated, ten-ribbed; herb acrid. Usually in compressed oblong rectangular packages weighing each from half a pound to a pound; somewhat like chopped hay. Has a peculiar somewhat irritating odour, and a burning taste, which is not apparent until some time after it has been chewed. Contains, in addition to colouring matter, a volatile oil, *Lobelic Acid*, and *Lobelina*, an alkaline principle, which is a yellowish liquid with a tobacco-like odour.

FIG. 221.—Lobelia Inflata. The Indian Tobacco.

Official Preparations.—TINCTURA LOBELIÆ.—Tincture of Lobelia (lobelia, in No. 40 powder, and proof spirit. Prepared by maceration and percolation).

Dose.—10 minims to ½ fluid drachm.

TINCTURA LOBELIÆ ÆTHEREA.—Ethereal Tincture of Lobelia (lobelia, in coarse powder, and spirit of ether. Prepared by maceration).

Dose.—10 minims to ½ fluid drachm.

Therapeutics.—Lobelia is expectorant and diaphoretic when given in small doses, and emetic or cathartic in larger doses. In too great quantity it is followed by much depression, nausea, cold sweats, and even death, preceded by convulsions; its action is very similar to that of tobacco. It has been much employed in the treatment of spasmodic asthma, and in other affections of the air-passages accompanied by dyspnœa. As an adjunct to diuretics it has sometimes proved of service.

Loganiaceæ or Apocynaceæ.

1.—GELSEMIUM NITIDUM. THE YELLOW JASMINE.

Gelsemium.—YELLOW JASMINE.—The dried RHIZOME and ROOTLETS of Gelsemium Nitidum (fig. 222). Grows in the Southern States of North America.

FIG. 222.—Gelsemium Nitidum. The Yellow Jasmine.

Characters.—Nearly cylindrical, from half an inch to six inches or more in length, and usually from a quarter to three-quarters of an inch in diameter—with small rootlets, either attached to, or mixed with, the larger pieces; externally light yellowish-brown and marked longitudinally with dark-purplish lines. Fracture splintery; the bark is thin, and shows silky fibres in its liber, and it is closely attached to a pale-yellow porous woody axis, with evident medullary rays, either with or without pith.

Taste bitter; odour somewhat narcotic and aromatic. Contains an alkaloid *Gelsemin* combined with *Gelseminic Acid* and a *resin.*

Dose.—5 to 30 grains.

Official Preparations.—EXTRACTUM GELSEMII ALCOHOLICUM.—Alcoholic Extract of Gelsemium (gelsemium, in

No. 60 powder, rectified spirit, and distilled water; prepared by maceration, percolation, and evaporation to a suitable consistence).

Dose.—½ to 2 grains.

TINCTURA GELSEMII.—Tincture of Gelsemium (gelsemium, in No. 40 powder, and proof spirit).

Dose.—5 to 20 minims.

Therapeutics.—The chief effects of Gelsemium are upon the nervous system. In man it acts primarily upon the motor tract of the spinal cord, causing loss of power over the voluntary muscles. Anæsthetic effects are not exhibited unless poisonous doses have been given. Its action somewhat resembles that of hemlock, but differs from that drug by acting primarily upon the nerve centres, instead of upon their end organs, and in affecting both the sensory and motor functions. The yellow jasmine has been used as a sedative in rheumatism, muscular spasm, and in various forms of neuralgia. It has also been given in pneumonia, pleurisy, asthma, spasmodic cough, and laryngitis.

2.—STROPHANTHUS HISPIDUS. THE KOMBÉ

Strophanthi Semina.—The mature ripe SEEDS freed from the awns of Strophanthus Hispidus, or Kombé, since from it is prepared the Kombé arrow-poison used in many parts of Africa, in the Manganja country near the Zambesi River, in Guinea, in Senegambia, and in the Gaboon district, in which it is known as Inée, Onaye, or Onage.

The Strophanthus Dichotomus is shown in fig. 223.

FIG. 223.—Strophanthus Dichotomus.

Characters.—Oval acuminate, about three-fifths of an inch long and one-sixth of an inch broad, the base narrowed but blunt, the apex when present tapering to a fine extremity, flattened at the sides, the dorsal surface being more or less convex; greenish-fawn in colour, covered with appressed silky hairs;

one side with a longitudinal ridge running from the centre to the pointed apex. Kernel white and oily, consisting of a straight embryo with two thin cotyledons surrounded by a thin albumen ; odour characteristic ; taste very bitter. After soaking in water the seed-coat is easily removed.

Official Preparation.—TINCTURA STROPHANTHI.—Tincture of Strophanthus (strophanthus, reduced to No. 30 powder, dried, and moistened with pure ether). Prepared by percolation, maceration, and the addition of rectified spirit.

Dose.—2 to 10 minims.

Therapeutics.—Strophanthus acts as a powerful cardiac tonic and diuretic, in many cases replacing digitalis. Its effects are found to be non-cumulative. It is stated to be of special value in the cardiac failure of prolonged typhoid fever. It has been found especially valuable in stenosis, but unsuitable in aortic disease. The force and strength of the pulse improve under its administration. It has also been given in angina pectoris, and has been successfully administered in tetanus and exophthalmic goitre. In some cases intermittency of the pulse has followed, but this result has passed off with increase of the dose. It has also produced disturbance of the alimentary canal.

3.—STRYCHNOS NUX VOMICA. THE KOOCHLA TREE.

Nux Vomica.—NUX VOMICA.—The SEEDS of Strychnos Nux-Vomica (figs. 224-227). Grows in the East Indies, from which it is imported.

Characters.—Nearly circular and flat, $\frac{7}{8}$ of an inch to more than about an inch in diameter, umbilicated and concavo-convex on one side, externally of an ash-grey or yellowish-green colour, thickly covered with short satiny hairs, internally somewhat translucent, tough and horny, taste intensely bitter ; inodorous. The fruit resembles an orange in shape, and when ripe is filled with a jelly-like pulp in which the *seeds* are contained. Contains three alkaloids, *Strychnina*, *Brucina*, and *Igasurina*, united with *Strychnic* or *Igasuric Acid*. A magnified

view of a portion of the seed-coats of Nux Vomica is shown in fig. 225.

These seeds have two coats: the outer one, or *Testa*, is

FIG. 224.—Strychnos Nux-Vomica. The Koochla Tree.

FIG. 225.—Magnified view of a portion of the seed-coats of Nux Vomica. *a*, testa with hairs attached; *b*, endopleura; *c*, albumen.

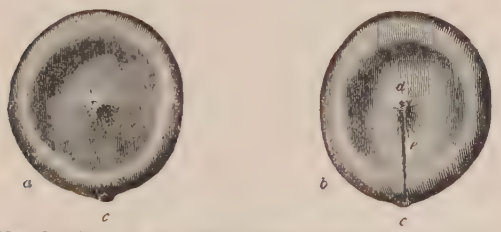


FIG. 226.—Nux Vomica. *a*, the dorsal surface; *b*, the ventral or concave surface; *c*, prominence indicating the chalaza and radicle; *d*, hilum or umbilicus; *e*, raphe.

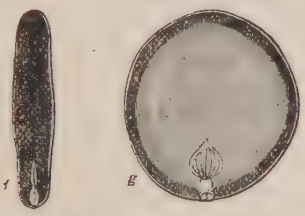


FIG. 227.—Sections of Nux Vomica. *f*, transverse section of seed, showing the bipartite albumen, the cavity and the embryo; *g*, vertical section, exposing the internal cavity, and showing the situation and figure of the embryo.

simple and fibrous, giving origin to short silky hairs of an ash-grey or yellowish colour, which are directed from the centre towards the circumference; within this coat is the inner

coat or *Endopleura*, which is simple and very thin, and which envelops the nucleus of the seed.

The nucleus is composed of two parts, viz. albumen and embryo. The *Albumen* is bipartite, horny, or cartilaginous ; it is of a dirty white colour, intensely bitter in taste, and has in its interior a cavity termed *loculamentum verum*. This albumen, unlike that of most seeds, is of a poisonous character.

The *Embryo* is milk-white and situated in the circumference of the seed, its locality being often indicated by a point somewhat more projecting than the parts surrounding. It consists of two cordiform (heart-shaped), large, thin cotyledons, with a distinct caudiculus, and a radicle which is centripetal, *i.e.* directed towards the centre of the fruit.

Dose, in powder.—2 to 5 grains.

Official Preparations.—Extractum Nucis Vomicæ.—Extract of Nux Vomica (nux vomica heated to 212° Fahr. is reduced to powder, then macerated in rectified spirit and distilled water, being finally percolated and evaporated to a proper consistence). Should contain 15 per cent. of total alkaloid.

Dose.—½ grain to 2 grains. Used in preparing the following :—

Tinctura Nucis Vomicæ.—Tincture of Nux Vomica (extract of nux vomica dissolved in distilled water and rectified spirit). Contains 1 grain of the alkaloids of nux vomica in each fluid ounce.

Dose.—10 to 20 minims.

Strychnina.—Strychnine, $C_{21}H_{22}N_2O_2$.—An alkaloid prepared from Nux Vomica (nux vomica, acetate of lead, solution of ammonia, rectified spirit, and distilled water).

By digestion with water and rectified spirit, the nux vomica seeds (reduced to powder) are exhausted of the *Igasurates of Strychnina* and *Brucina* ; acetate of lead is now added, *Acetates* of *Strychnina* and *Brucina* being formed, and *Igasurate* of *Lead* precipitated. The mixture is filtered, and to the filtrate ammonia is added to precipitate the alkaloids, *Acetate of Ammonium* being left in the solution. The precipitated alkaloids are dissolved in spirit, and the spirituous solution evaporated, the yellowish mother liquor, containing the brucina

of the seeds, being cautiously poured off from the white crust of strychnina which adheres to the vessel. The strychnina is washed until the washings no longer give a red colour with nitric acid, showing freedom from brucina, and it is finally dissolved in boiling water and crystallised.

Tests.—Strychnina crystallises in four-sided prisms or needle-shaped octahedra ; it is intensely bitter, and gives, with sulphuric acid, a colourless solution which, when bichromate of potassium is added, yields an *iridescent play* of colours passing from yellow to violet.

Dose.—$\frac{1}{30}$ to $\frac{1}{12}$ grain.

Official Preparation.—Liquor Strychninæ Hydrochloratis.—Solution of Hydrochlorate of Strychnine (strychnine in crystals, diluted hydrochloric acid, rectified spirit, and distilled water). = (about 1 in 100).

Dose.—5 to 10 minims.

Brucina is more soluble in water and less bitter than strychnina. It gives a *deep red colour* with nitric acid.

Igasuric or Strychnic Acid in solution precipitates copper salts *bright-green.*

A third alkaloid, Igasurina, has been said to reside in nux vomica.

Therapeutics.—The chief if not the entire action of nux vomica depends upon its strychnina. This alkaloid acts especially upon the motor tract of the spinal cord, increasing the reflex excitability of that cord, and when taken in poisonous doses the slightest stimulus excites tetanic spasms. It is said to cause a rise of blood pressure and a contraction of the peripheral arterioles ; it does not directly influence the cerebral centres, the voluntary muscles, or the heart.

In man this substance causes rigidity and twitching of the muscles, succeeded by tetanoid spasms, consciousness being retained. The muscles are relaxed during the intervals of the paroxysms. A fatal issue may result from exhaustion between the spasms, or from apnœa during a spasm, the latter being due to protracted rigidity of the respiratory muscles. Strychnina affects paralysed parts more readily than those which are sound ; and it is eliminated by the urine.

Chloroform, chloral, and physostigmine, and keeping up artificial respiration, have averted the fatal effects of strychnine.

Medicinally the action of strychnine is that of a bitter stomachic, and it is given in some forms of dyspepsia, as pyrosis. When combined with purgatives it increases their efficacy.

Brucine, when *pure*, appears to produce none of the effects of strychnine, even when given in large doses ; it may, perhaps, be antiperiodic and tonic.

Nux Vomica is much employed in the treatment of paralysis, especially when dependent upon lead poisoning, and it has sometimes been given in paraplegia and hemiplegia. It is also useful in giving tone to the muscular system in cases of debility, and may be employed in hysteria and depression of spirits. Its aphrodisiac properties are frequently well marked, and it is administered in cases of impotence resulting from nervous exhaustion. Finally, it may be given in chorea and in other spasmodic affections.

Some persons are exceedingly sensitive to the action of strychnine and nux vomica ; 10 minims of tincture of nux vomica, and $\frac{1}{45}$ grain of strychnine, have caused serious symptoms.

Hypodermically administered, $\frac{1}{120}$ to $\frac{1}{60}$ of a grain of strychnine dissolved in acid, or 1 to 5 minims of the liquor strychninæ hydrochloratis, may be used.

Adulteration of Strychnine.—Brucine in variable, sometimes large, quantity, detected by the deep-red colour it gives with nitric acid.

Fig. 228.—Fruit of the Strychnos Potatorum. The Clearing Nut.

The fruit of the **Strychnos Potatorum** or Clearing Nut is seen in fig. 228. It is a shining berry, and when ripe is black. It contains one seed about the size of a cherry stone. The seeds are used as fining agents for clearing water.

The **Strychnos Tieuté** is a large climbing shrub growing in Java. The aqueous extract of the bark of this tree is the poison called the Upas Tieuté, which consists of strychnine combined with an acid, probably igasuric. The effects of this poison are exactly similar to those of nux-vomica and strychnine.

This poison must not be confounded with that of the **Antiaris Toxicaria** (fig. 229) or Arbor Toxicaria, known as the *true poison tree* of Java, belonging to the natural order Artocarpaceæ. It is from sixty to a hundred feet high. The milky

Fig. 229.—Antiaris or Arbor Toxicaria. True Poison Tree of Java.

juice is collected by incision, and then inspissated by boiling with the juice of arum, galanga, and onions. The poison is said to consist of the active principle *Antiarin*, with an undetermined acid, resin, and gummy matter. It acts upon the brain and spinal cord, and causes vomiting and convulsions with alternations of relaxation.

Oleaceæ.

1.—FRAXINUS ORNUS. THE FLOWERING ASH.

Manna.—MANNA.—A CONCRETE SACCHARINE EXUDATION obtained by making transverse incisions in the stems of cultivated trees of Fraxinus Ornus, chiefly in Calabria and Sicily.

FIG. 230.—Extraction of Manna. *a*, stem of the tree; *b*, leaf of the Ornus; *c*, incision; *d*, leaf of the Indian fig; *e*, hooked knife. In the right hand of each of the collectors is a box to contain the manna, which is afterwards transferred to a basket.

The Extraction of Manna (fig. 230).—In the Manna districts in Sicily the Fraxinus Ornus is cultivated in separate square plantations. The trees are not tapped until they cease to produce more leaves, which takes place about July or August. Cross or transverse incisions, of two inches long, are made in the stem by means of a curved or hooked knife, commencing at the lower part near the soil, and are repeated daily in warm weather, extending them perpen-

dicularly upwards in order to leave the stems uninjured on one side, which is cut the next year. In the lowermost sections small leaves of the ash are inserted to conduct the juice into a receptacle formed by a leaf of Opuntia. In this manner is obtained *manna in sorts* (the Capace or Gerace manna). The *flake manna* is obtained during the height of the season, when the juice flows vigorously. It is procured from the upper incisions, in which the juice is less fatty than that in the lower part, and consequently dries more easily in tubes and flat pieces. The masses which remain adhering to the stems after the removal of the inserted leaves are scraped off, and constitute the *cannulated manna in fragments*. The younger stems yield more of the cannulated kind of manna, the older ones more of the fatty sort. For a good harvest dry and warm weather is necessary.

Characters.—In stalactitic pieces varying in length and thickness, flat or concave on their inner surface, and of a pale yellowish-brown colour. Irregularly convex and nearly white externally. The best Manna, known as Flake manna, is brittle, crisp, porous, crystalline in structure, and readily dissolves in six parts of water; odour and taste resembling honey; slightly bitter and acrid. Consists principally of a peculiar sugar named mannite, $C_6H_6(HO)_6$, together with indefinite matter and *Fraxin*, to which the colour is due.

Dose.—60 grains to 1 ounce or more.

Therapeutics.—A very mild laxative, suitable for children; it is occasionally given as an agreeable adjunct to some purgative draughts; it sometimes causes griping and flatulence.

2.—OLEA EUROPÆA. THE EUROPEAN OLIVE.

Olivæ Oleum.—Olive Oil.—The oil expressed from the ripe fruit of Olea Europæa (figs. 231, 232). From the south of Europe, growing near the shores of the Mediterranean.

Characters.—Pale-yellow or greenish-yellow, with scarcely any odour, and a bland oleaginous taste; congeals partially at about 36° Fahr. (2°·2 C.). Consists of about 70 per cent. of a fluid portion, *Oleine*, or *Oleate of Glyceryl*, $C_3H_53C_{18}H_{33}O_2$,

and 28 per cent. of a solid portion, which is a mixture of *Palmitin*, $C_3H_5C_{16}H_{31}O_2$, and *Stearin*, $C_3H_5C_3C_{18}H_{35}O_2$.

FIG. 231.—Olea Europæa. The Olive.

FIG. 232.—Olea Europæa. *a*, fruit, showing the stone.

Olive oil unites with alkalies to form soaps.

It is contained in *Charta Epispastica*, *Enema Magnesii Sulphatis*, and some *Emplastra*, *Linimenta*, and *Unguenta*.

Sapo Animalis.—CURD SOAP.—Soap made with soda and a purified animal fat consisting principally of stearin. Although not made with olive oil, it is placed here for the sake of convenience.

Characters.—White, or with a very light greyish tint, dry and nearly inodorous; horny and, when kept in warm dry air, pulverisable; when incinerated yields an ash which does not deliquesce.

Used in the preparation of *Pilula Scammonii Composita* and *Pilula Phosphori* and in the *Suppositoria: Acidi Carbolici cum Sapone; Morphinæ cum Sapone; Acidi Tannici cum Sapone;* also in *Linimentum Potassii Iodidi cum Sapone, Extractum Colocynthidis Compositum,* and some *Emplastra.*

Sapo Durus.—HARD SOAP.—White Castile soap (soap made with olive oil and soda).

Characters.—Greyish-white, dry and inodorous; horny and pulverisable when kept in dry air, often blue or red when of the Castile variety, due to the presence of some oxide of iron; composed of *oleate* and *palmitate of sodium*; when incinerated it yields an ash which does not deliquesce.

Used in *Linimentum Saponis,* and in many *Pilulæ.*

Sapo Mollis.—SOFT SOAP.—Soap made with olive oil and potash; yellowish-green, inodorous, of a gelatinous consistence; composed of *oleate* and *palmitate of potassium*; when incinerated yields an ash which is very deliquescent.

Contained in *Linimentum Terebinthinæ.*

Therapeutics.—Internally olive oil is employed as a demulcent, in the form of an emulsion; it may also be used as an enema. It is slightly laxative in large doses. Soap acts as an antacid, but is liable to disagree with the stomach, since the fatty acids may be set free. It is of no particular value as an internal remedy, but is employed almost exclusively as an adjunct to other drugs, and for the formation of pills.

Salicaceæ.

SALIX ALBA. THE WHITE WILLOW. POPULUS.

Salicinum.—SALICIN, $C_{13}H_{18}O_7$.—A crystalline GLUCOSIDE obtained by treating the bark of Salix Alba and other species of Salix and the bark of various species of Populus with hot

water, removing colouring matter and tannin from the decoction, evaporating, purifying, and recrystallising.

Characters and Tests.—Colourless shining crystals with a very bitter taste. Soluble in about 28 parts of water. Coloured red by sulphuric acid. When heated with red chromate of potassium and sulphuric acid it yields the vapour of an oil having the odour of meadow-sweet.

Dose.—3 to 20 grains.

Therapeutics.—Tonic like salicylic acid (resembling sulphate of quinine) and less liable to irritate the stomach.

Santalaceæ.

SANTALUM ALBUM. THE WHITE SANDAL.

Santali Oleum.—Oil of Sandal wood.—The oil distilled from the wood of Santalum Album. Native of India.

Characters and Tests.—Of thick consistence, colour pale-yellow, odour strongly aromatic, flavour pungent and spicy. Reaction neutral or slightly acid. Readily soluble in water.

Dose.—10 to 30 minims given in capsules or made into an emulsion with solution of potash, or suspended in mucilage.

Therapeutics.—The chief action of sandal-wood oil is exerted upon the urino-genital system. During its excretion in the urine it acts internally as a remote astringent upon all mucous surfaces, and as a stimulant to involuntary muscular tissue.

It has been given successfully in gonorrhœa and gleet, leucorrhœa, chronic bronchitis, and in diarrhœa.

Sapotaceæ.

DICHOPSIS GUTTA. THE TABAN TREE.

Gutta-Percha.—Gutta-Percha.—The concrete juice of Dichopsis Gutta (figs. 233 A, 233 B), but also derived from several other trees belonging to this natural order; grows in Borneo, Sumatra, and the other Islands of the Eastern Archipelago.

Characters.—In tough, somewhat flexible pieces, of a light-brown or chocolate colour. Soluble, or nearly so, in chloroform, and entirely so in oil of turpentine.

1 Inflorescence. 2 Flower. 3 Flower opened, exposing the stamens and pistil. 4 Pistil, with the stamens removed. 5 Vertical section of the ovary. 6 Section of the ovary, showing the ovules.

FIG. 233 B.—Dichopsis Gutta 2, flower expanded; 7, scarcely mature fruit (natural size); 8, transverse section of same. (All but fig. 7 magnified.)

Commercial gutta-percha consists of three distinct portions, pure *Gutta* (about 80 per cent.), a milk-white solid ($C_{20}H_{32}$), a crystalline resin ($C_{20}H_{32}O_2$), and an amorphous resin ($C_{20}H_{32}O$).

Official Preparation.—LIQUOR GUTTA-PERCHA.—Solution of Gutta-Percha (gutta-percha, in thin slices, is dissolved in chloroform; carbonate of lead, in fine powder, is mixed with chloroform. The two solutions are added together, and the insoluble matter is allowed to subside; the clear liquid is then decanted and kept in a stoppered bottle). Employed in the preparation of *Charta Sinapis*.

Use.—Chiefly used for its physical properties for making splints.

Scrophulariaceæ.

DIGITALIS PURPUREA. THE PURPLE FOXGLOVE.

Digitalis Folia.—DIGITALIS LEAVES.—The LEAVES of Digitalis Purpurea (fig. 234). Collected from wild British plants, of the second year's growth, when about two-thirds of the flowers are expanded, and carefully dried.

The general characters of the Digitalis inflorescence are shown in Digitalis Laciniata, Minor, Rigida, and Ochroleuca (figs. 235–8).

Characters.—From four to twelve or more inches long; sometimes as much as five or six inches broad, with a winged petiole of varying length; ovate, ovate-lanceolate, subacute, crenate, or irregularly crenate-dentate, somewhat rugose, being slightly hairy and dull-green, densely pubescent and paler beneath. Taste very bitter and unpleasant; odour agreeable, faint, and tea-like.

Dose, in powder.—$\frac{1}{2}$ to 1$\frac{1}{2}$ grain.

Official Preparations.—Infusum Digitalis.—Infusion of Digitalis (foxglove leaves, dried, and boiling distilled water).

Dose.—2 to 4 fluid drachms.

Tinctura Digitalis.—Tincture of Digitalis (Foxglove leaves, in No. 20 powder, and proof spirit; prepared by maceration and percolation).

Dose.—10 to 30 minims.

The digitalis leaves are stated to contain at least five principles, viz. *Digitalein*, *Digitalin*, *Digitonin*, *Digitin*, and *Digitoxin*. They are all glucosides, except the last, and are non-nitrogenous. Digitoxin, digitalin, and digitalein are cardiac poisons. The two former are insoluble in water, the latter readily soluble. Digitonin is a powerful irritant, a muscular poison, and a local anæsthetic.

Therapeutics.—When given in small doses digitalis induces a rise of the blood pressure in the arteries, and a contraction of the systemic arterioles, the heart contracting more powerfully and slowly. Under its influence poisonous doses render the heart's action quick and irregular, and the organ finally stops beating, with its ventricles firmly contracted.

When medicinally administered, the most notable effect is slowing of the pulse. If the dose be increased, dangerous symptoms may supervene, viz., vomiting, purging, and faintness; patients under the full influence of digitalis should always assume the horizontal position, since when sitting or standing the above symptoms may arise.

Digitalis may very appropriately be termed the *Pendulum of the Heart*, since it diminishes increased action of that organ, and assists its driving power when such power is deficient. It is most serviceable in cases of mitral disease and in hypertrophy

with dilatation of the heart. In aortic regurgitation its efficacy is more than doubtful; its administration in this affection is

FIG. 234.—Digitalis (Foxglove) leaves. *a*, first year's leaf; *b*, second year's leaf.

FIG. 235. Digitalis Laciniata. FIG. 236.—Digitalis Minor. FIG. 237.—Digitalis Rigida. FIG. 238.—Digitalis Ochroleuca.

said to be hazardous, since it may drive the ventricle into a state of contraction, from which it may never become relaxed. It should be used with caution when the vascular system is

atheromatous and the heart's muscular tissue fatty; also when the temperature is high, in order to avoid too great depression of the pulse during defervescence.

Digitalis is used as a *diuretic* in dropsy, especially when associated with heart disease; but it should never be given in the dropsy of chronic Morbus Brightii.

It is a valuable remedy in the treatment of hæmorrhage, especially from the lungs, and has been used in delirium tremens for inducing sleep, and also in acute mania.

The action of Digitalis is said to be *cumulative*, *i.e.* during its use alarming symptoms may arise, and without any previous increase of dose.

Adulterations.—The leaves of Verbascum Thapsus and other plants. The characters of the true leaves as previously stated will easily detect such adulterants.

Solanaceæ.

CAPSICUM FASTIGIATUM. CHILLIES.

Capsici Fructus.—CAPSICUM FRUIT.—The dried ripe FRUIT of Capsicum Fastigiatum. Imported from Zanzibar, and dis-

FIG. 239.—Solanum Tuberosum. The Potato.

FIG. 240.—Solanum Dulcamara. The Woody Nightshade.

tinguished in commerce as Guinea Pepper, Pod Pepper, Chillies.

Characters.—Pod membranous, of a bright scarlet or orange colour, from half to three-quarters of an inch long, and a quarter of an inch broad, cylindrical or conical, shining,

smooth, but somewhat corrugated on the surface, enclosing several small roundish or ovoid flat seeds. Taste intensely pungent.

Contains an acrid, volatile, crystalline alkaloid, *Capsicin*, and red extractive or colouring matter.

Dose, in powder.—½ to 1 grain in pills.

Official Preparation.—TINCTURA CAPSICI.—Tincture of Capsicum (capsicum fruit, bruised, and rectified spirit. Prepared by maceration and percolation).

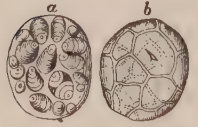


FIG. 241. Cells of the Potato. *a*, cell before boiling, containing starch particles; *b*, cell of a mealy potato after boiling.

Dose.—10 to 20 minims.

Therapeutics.—Capsicum is a powerful topical stimulant, chiefly employed as a condiment (cayenne pepper), but sometimes used in dyspepsia (especially that of dipsomaniacs), diarrhœa, and excessive prostration; also as a gargle in scarlatinal and other forms of sore throat; externally it may be used as a rubefacient.

The Solanum Tuberosum (the Potato) and the Solanum Dulcamara (the Bitter Sweet or Woody Nightshade), belonging to the natural order Solanaceæ, are shown in figs. 239–40. Fig. 241 shows the cells of the Potato.

Styraceæ.

STYRAX BENZOIN.

Benzoinum.—BENZOIN.—A balsamic RESIN obtained from Styrax Benzoin, and probably from one or more other species of Styrax. It is generally procured by making deep incisions in the bark of the trees, and allowing the liquid that exudes to concrete by exposure to the air. Grows in Siam, Sumatra, Borneo, and other islands of the Eastern Archipelago.

Characters.—In masses, consisting of agglutinated tears, or of a brownish mottled mass with or without white tears imbedded in it. Some specimens on fracture present an almond-like appearance, the tears being milk-white, and an inch or more in length. In others the white substance is in very small quantity, the masses when broken resembling reddish-brown

granite (Siam Benzoin); has little taste, but an agreeable odour, somewhat like vanilla; gives off, when heated, fumes of benzoic acid; is soluble in rectified spirit and in solution of potash.

Official Preparations.—ACIDUM BENZOICUM.—Benzoic Acid (see p. 64).

TINCTURA BENZOINI COMPOSITA.—Compound Tincture of Benzoin (benzoin, in coarse powder; prepared storax; balsam of tolu; socotrine aloes; rectified spirit. Prepared by maceration).

Dose.—½ to 1 fluid drachm.

Benzoin is also contained in *Adeps Benzoatus* and *Unguentum Cetacei.*

Therapeutics.—This substance is a stimulating expectorant, and was at one time employed in chronic bronchitic affections. Externally it is applied to ulcers and wounds in the form of the tincture which is popularly known as Friar's Balsam.

Valerianaceæ.

VALERIANA OFFICINALIS.

Valerianæ Rhizoma.—VALERIAN RHIZOME.—The dried RHIZOME and ROOTLETS of Valeriana Officinalis (fig. 242). Collected in autumn from plants growing wild or cultivated in Britain.

Characters.—A short, erect rhizome, entire or sliced, externally dark yellowish-brown, with numerous slender, shrivelled rootlets three or four inches long; internally whitish. Having a strong camphoraceous and slightly bitter taste; odour strong, characteristic, and disagreeable, developed in the process of drying; yields a volatile oil and valerianic acid when distilled with water. The volatile oil consists of a substance *Valerole*, and a hydrocarbon *Borneene.*

Dose, in powder.—10 to 30 grains.

Official Preparations.—INFUSUM VALERIANÆ.—Infusion of Valerian (valerian rhizome, bruised, and boiling distilled water).

Dose.—1 to 2 fluid ounces.

Tinctura Valerianæ.—Tincture of Valerian (valerian rhizome, in No. 40 powder, and proof spirit. Prepared by maceration and percolation).

Dose.—1 to 2 fluid drachms.

Tinctura Valerianæ Ammoniata.—Ammoniated Tinc-

Fig. 242.—Valeriana Officinalis. *a*, the flower.

ture of Valerian (valerian rhizome, in No. 40 powder, and aromatic spirit of ammonia ; prepared by maceration).

Dose.—½ to 1 fluid drachm.

Therapeutics.—Valerian is a powerful stimulant and antispasmodic. It is given in hysteria, chorea, epilepsy, and hypochondriasis, and as an adjunct to tonics. With respect to its antispasmodic powers it is, however, very inferior to asafœtida.

SUB-CLASS IV.—APETALÆ.

Aristolochiæ.

ARISTOLOCHIA SERPENTARIA; RETICULATA. VIRGINIAN SNAKEROOT.

Serpentariæ Rhizoma.—SERPENTARY RHIZOME.—The dried RHIZOME and ROOTLETS of Aristolochia Serpentaria (fig. 243) or of Aristolochia Reticulata. Grown in Virginia and other parts of the United States.

Characters.—Rhizome twisted, about one inch long and one-eighth of an inch in diameter, giving off below a tuft of numerous slender rootlets, about three inches long, colour dull yellowish-brown, having an agreeable camphoraceous odour, and a warm, bitter, somewhat camphoraceous taste. Contains a volatile oil, resin, and bitter extractive matter.

FIG. 243.—Aristolochia Serpentaria. Virginian SnakeRoot.

Official Preparations.—INFUSUM SERPENTARIÆ.—Infusion of Serpentary (serpentary rhizome, in No. 20 powder; boiling distilled water).

Dose.—1 to 2 fluid ounces.

TINCTURA SERPENTARIÆ.—Tincture of Serpentary (serpentary rhizome, in No. 40 powder, and proof spirit. Prepared by maceration and percolation).

Dose.—$\frac{1}{2}$ to 2 fluid drachms.

Serpentary root is also contained in *Tinctura Cinchonæ Composita.*

Therapeutics.—Serpentary is stimulant, tonic, diaphoretic, and diuretic. It is occasionally used in dyspepsia, low febrile conditions, and in chronic rheumatism. It may be exhibited when guaiacum is not well borne, since this latter is said occasionally to disturb the bowels. It is stated to stimulate the capillary circulation, and to promote recovery in chronic forms of gouty inflammation.

Cannabinaceæ.

1.—CANNABIS SATIVA. INDIAN HEMP.

Cannabis Indica.—Indian Hemp.—The dried flowering or fruiting tops of the female plants of Cannabis Sativa (fig. 244) grown in India, and from which the resin has not been removed. In India it is known as Gunjah or Ganga.

Fig. 244.—Cannabis Sativa. Indian Hemp.

Characters.—Tops consisting of one or more alternate branches, bearing the remains of the flowers and smaller leaves, and a few ripe fruits, the whole pressed together by resinous adhesive matter, or the hemp is composed of straight, stiff, woody stems several inches in length, and surrounded by the branched flower stalks. It is rough to the touch, brittle, the colour dusky green ; has a faint, narcotic, peculiar odour. In commerce the resinous exudation of the flowers and leaves is known as *Churrus* ; the entire plant packed in long bundles is called *Ganga* or *Gungah* ; and a mixture of the capsules and leaves without the stem is termed *Bang*. Another form of Indian hemp, which sometimes occurs in coils, is the *Hashish* of the Arabs.

It contains a resin (*Cannabin*) and a little volatile oil.

Official Preparations.—Extractum Cannabis Indicæ.—Extract of Indian Hemp (Indian hemp, in coarse powder, is first macerated in rectified spirit, the spirit separated by distillation, and the residue evaporated by a water-bath to the consistence of a soft extract).

Dose.—$\frac{1}{4}$ to 1 grain. This extract is contained in

Tinctura Cannabis Indicæ.—Tincture of Indian Hemp (extract of Indian hemp, dissolved in rectified spirit) ; 22 grains of extract in one fluid ounce, nearly.

Dose.—5 to 20 minims.

Therapeutics.—Cannabis Indica produces a peculiar kind of intoxication, accompanied by exhilaration and hallucinations

of the senses, which are generally said to be of a pleasing nature, and are succeeded by narcotic effects, as sleep and stupor. The anodyne and soporific effects are said to be followed by less unpleasant after-effects than those of opium, the

FIG. 245.—Apocynum Cannabinum. Indian Hemp.

action of which it resembles ; no loss of appetite or constipation is induced by its administration. On account of its antispasmodic and anodyne powers, Indian Hemp has been employed in various forms of neuralgia, in whooping cough, asthma, tetanus, and hydrophobia.

The urine of patients under the influence of the drug sometimes acquires an odour somewhat resembling that of the Tonquin bean.

A tolerance of opium appears to establish in the system a similar capability of resisting the action of Indian Hemp.

Incompatibles.—Upon adding the tincture to water, a turbidity takes place from the precipitation of the resin ; it should therefore be rubbed up with mucilage, in order to suspend it, or a few drops of an alkaline solution, such as the aromatic spirit of ammonia, should be added.

The root of a species of Indian Hemp, known as the Apocynum Cannabinum (fig. 245), has been used in medicine, and possesses emetic, purgative, and diuretic properties.

2.—HUMULUS LUPULUS. THE HOP.

Lupulus.—Hop.—The dried strobiles of Humulus Lupulus (fig. 246). From plants cultivated in England. Found in many parts of Europe.

Fig. 246.—Humulus Lupulus. The Hop.

Fig. 247. Lupulinic Glands.

Characters.—In commercial specimens the strobiles are more or less compressed and broken ; when entire they are rounded in form, about an inch and a quarter in length, and consist of numerous thin greenish-yellow or brownish membranous imbricated scales or bracts ; each scale has at its base a small rounded achene, which is sprinkled over with brownish-yellow glands (lupulinic glands or grains (fig. 247), commonly called yellow powder or *Lupulin*). The odour is agreeably aromatic, the taste bitter and aromatic. *Lupulin* contains a bitter principle, *Humulin* or *Lupulite.*

Official Preparations.—Extractum Lupuli.—Extract of Hop (hop, macerated in rectified spirit, then boiled with dis-

tilled water ; the two products being mixed and evaporated to a proper consistence).

Dose.—5 to 15 grains.

INFUSUM LUPULI.—Infusion of Hop (hop and boiling distilled water).

Dose.—1 to 2 fluid ounces.

TINCTURA LUPULI.—Tincture of Hop (hop and proof spirit).

Dose.—½ to 2 fluid drachms.

LUPULINUM.—Lupulin.—A glandular powder obtained from the dried strobiles of Humulus Lupulus.

Characters and Tests.—A granular light brownish-yellow powder, which microscopically presents minute, somewhat globular, tap-shaped, translucent, shining, reticulated glands. Burns readily, and possesses the agreeable aromatic odour and taste of the hop.

Dose.—2 to 5 grains.

Therapeutics.—The Hop is stomachic, tonic, and somewhat narcotic ; it is given in some cases of atonic dyspepsia, and has been stated to allay chordee and to diminish the tendency to nocturnal emissions. Lupulin is bitter and aromatic ; it is used occasionally in sleeplessness and alcoholism. It is the best form of administering the hop ; it may also be combined advantageously with bromide of potassium, the lowering effects of which drug it may counteract.

Coniferæ or Pinaceæ.

1.—JUNIPERUS COMMUNIS. THE COMMON JUNIPER.

Juniperi Oleum.—OIL OF JUNIPER.—The OIL distilled in Britain from the full-grown unripe green fruit of Juniperus Communis (fig. 248). Grows in northern Europe.

Characters.—Colourless or pale greenish-yellow, having the characteristic odour of the fruit, and a warm aromatic taste. The juniper "berries" are of the size of black currants, of a deep purple colour, with a glaucous bloom when fully ripe. They have a slightly turpentine odour.

Official Preparation.—SPIRITUS JUNIPERI.—Spirit of Juniper (oil of juniper and rectified spirit).

Dose.—½ to 1 fluid drachm.

Spirit of Juniper is contained in *Mistura Creasoti.*

Therapeutics.—The oil of Juniper is a powerful stimulant,

FIG. 248.—Juniperus Communis. *a*, fruit approaching maturity; *b*, mature fruit; *c*, ripe fruit, seen from the apex; *d*, ripe fruit, seen from the base.

acting especially on the kidneys. It is chiefly used for its diuretic action in the various forms of dropsy, and is contained in Gin and Hollands.

2.—PINUS LARIX. THE COMMON LARCH.

Laricis Cortex.—LARCH BARK.—The BARK of Pinus Larix (fig. 249). Collected in spring; deprived of its outer rough portion and dried.

Characters.—In flat pieces or quills varying in length and size; the inner surface is nearly smooth and yellowish-white or pinkish-red according to its age; the outer surface dark-red

or rosy, somewhat uneven; fracture close except the liber, which is somewhat fibrous; fractured surfaces, except internally, deep carmine red; the odour faintly balsamic and terebinthinate. Taste astringent. Contains turpentine, sugar, gum, a volatile substance, *Larixin* or *Larixinic Acid*, a solution of which, with persalts of iron, turns to a purple colour; and peculiar tannin with which iron-salts strike an olive-green.

FIG. 249.—Pinus Larix. The Common Larch.

Official Preparation.—TINCTURA LARICIS. — Tincture of Larch (larch bark, in No. 40 powder, and rectified spirit; prepared by maceration and percolation).

Dose.—20 to 30 minims.

Therapeutics.—The action of the Larch is similar to that of other balsamic and terebinthinate remedies; it is, however, less apt to interfere with digestion, and is more pleasant to the taste. It is expectorant, stimulant, and astringent, and is used in purpura and intestinal hæmorrhage; also in chronic bronchitis and cystitis.

3.—PINUS PICEA. THE SPRUCE FIR.

Pix Burgundica.—BURGUNDY PITCH.—A RESINOUS EXUDATION obtained from the stem of Pinus Picea (fig. 250). Melted and strained; imported from Switzerland.

FIG. 250.—Pinus Picea. The Spruce Fir.

Characters.—Hard and brittle, yet gradually taking the form of the vessel in which it is kept; opaque, varying in colour, but generally dull reddish-brown or yellowish-brown; fracture clear and conchoidal; odour agreeable and aromatic, especially when heated; taste sweet, aromatic without bitterness; readily soluble in

glacial acetic acid. Consists chiefly of resin, but contains a volatile oil, to which the odour is due.

Official Preparation.—EMPLASTRUM PICIS.—Pitch Plaster (Burgundy pitch, common frankincense, resin, yellow wax, expressed oil of nutmeg, olive oil, and water).

Burgundy pitch is also contained in *Emplastrum Ferri.*

Therapeutics.—Externally it acts as a slight stimulant to the skin.

Adulterations.—In commerce it is rare to meet with true Burgundy pitch. A fictitious pitch is frequently sold, which is composed of common resin, coloured and rendered opaque with yellow ochre, water, palm oil, &c.

4.—PINUS SYLVESTRIS. THE SCOTCH FIR.

Pix Liquida.—TAR.—A BITUMINOUS LIQUID obtained from the wood of Pinus Sylvestris (fig. 251) and other species of Pinus by destructive distillation.

FIG. 251.—Pinus Sylvestris. The Scotch Fir.

Characters.—A dark-brown or blackish semi-liquid substance of a well-known peculiar aromatic odour. Water shaken with it acquires a pale-brown colour. Taste sharp and empyreumatic; reaction acid. The composition of tar is very complex. It contains pyroligneous acid, acetic acid, methylic alcohol, *Colophonic Acid*, and an empyreumatic oil, from which are obtained creasote, paraffin, &c., together with xylene and toluene, and various other hydrocarbons. Pitch is the altered resin which results from the distillation of the tar.

Preparation of Tar (fig. 252).—A conical cavity is made in the ground, usually in the side of a bank or sloping hill, and the roots of the fir, together with logs and billets of the same, neatly trussed in a stack of the same conical shape, are let into

this cavity. The whole is then covered by turf (to prevent the dissipation of the volatile parts), which, by means of a heavy wooden mallet and wooden stamper, worked separately by two men, is beaten down, and made as firm as possible about the wood. The stack of billets is now kindled, and slow combustion of the fir takes place, without flame, as in working charcoal. During this combustion the tar exudes, and a cast-iron pan being at the bottom of the funnel with a spout projecting through the side of the bank, barrels are placed beneath the spout to

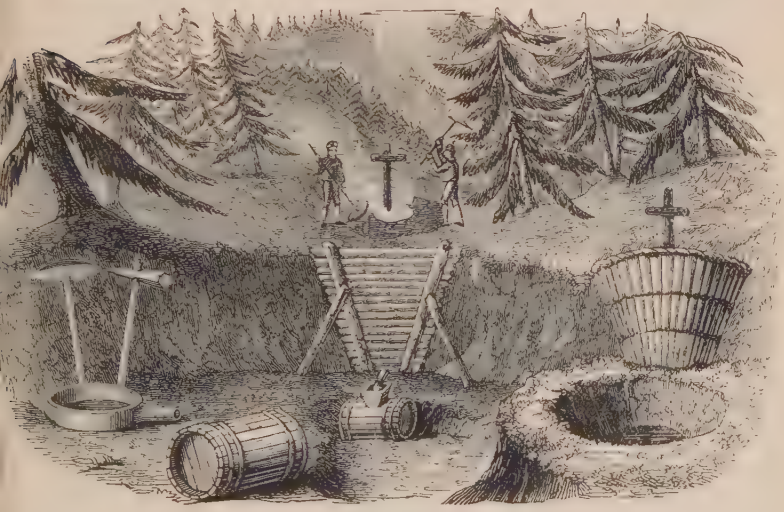


Fig. 252.—Preparation of Tar.

collect the fluid as it comes away. As soon as the barrels are filled they are bunged, and are ready for exportation. The situation most favourable to the process is a forest near a bog or marsh, since the roots of the fir, which principally yield the tar, are always most productive in such places.

Official Preparation.—Unguentum Picis Liquidæ.—Ointment of Tar (tar and yellow wax).

Therapeutics.—Tar acts both as an internal and external stimulant. It is useful in chronic skin diseases, as psoriasis, eczema, and pityriasis rubra. It has been employed internally

in bronchitic affections. Sometimes it causes a dark discoloration of the urine. Tar vapour is advantageously used in phthisis and chronic bronchitis.

Pini Sylvestris Oleum.—Fir-wool Oil.—The oil distilled from the fresh leaves of Pinus Sylvestris.

Characters and Tests.—Colourless or nearly so, having an aromatic lavender-like odour, and pungent but not unpleasant flavour. Soluble in about seven times its volume of rectified spirit.

Official Preparation.—Vapor Olei Pini Sylvestris.—Inhalation of Fir-wool oil. (Fir-wool oil rubbed with light carbonate of magnesium and water added; 40 minims of the oil and 20 grains of the carbonate to the ounce of water). When required to be inhaled one drachm of the mixture is added to half a pint of cold water and half a pint of boiling water, and the whole placed in an apparatus so arranged that air may be made to pass through the solution, and may be afterwards inhaled.

Therapeutics.—This oil is used as an embrocation, and also as an addition to baths in rheumatism. The vapour is useful as an inhalation in sore throat and chronic laryngitis.

5.—PINUS. VARIOUS SPECIES.

Resina.—Resin.—The residue left after the distillation of the oil of turpentine from the crude oleo-resin (turpentine) of various species of Pinus.

Characters.—Translucent, yellowish, brittle, compact, pulverisable, fracture shining; odour and taste faintly terebinthinate. It is easily fusible, and burns with a dense yellow flame and much smoke. Contains a considerable amount of *Abietic Anhydride* (which by the action of alcohol is converted into *Abietic Acid*), and also a small proportion of *Pimaric Acid*.

Official Preparations.—Emplastrum Resinæ.—Resin Plaster (resin, lead plaster, and curd soap).

Unguentum Resinæ.—Ointment of Resin (resin, in coarse powder; yellow wax, simple ointment, and almond oil).

Resin is also contained in *Charta Epispastica* and *Unguentum Terebinthinæ;* and in *Emplastra: Calefaciens; Cantharidis; Picis; Saponis;* and *Plumbi Iodidi.*

Therapeutics.—Resin is only used as an external stimulant application.

6.—JUNIPERUS OXYCEDRUS.

Cadinum Oleum.—Oil of Cade.—This is also known as "Huile de Cade," or Juniper Tar-oil, and is an empyreumatic oily liquid obtained by the destructive distillation of the woody portions of Juniperus Oxycedrus (fig. 253) and some other species. Obtained in Germany and France.

Fig. 253.—Juniperus Oxycedrus.

Characters.—A dark reddish-brown or nearly black, more or less viscid oily liquid, with a not unpleasant empyreumatic odour, and an aromatic bitter and acrid taste. Specific gravity about 0·990. It is soluble in ether and chloroform; partially soluble in cold, almost wholly in hot rectified spirit. In water it is very slightly soluble. The filtered aqueous solution is almost colourless, and possesses an acid reaction.

Uses.—The odour is less disagreeable, it is cleaner, and considered to be more efficacious, than common tar. It is used as an ointment in the treatment of eczema (1 in 4 of vaseline), and in psoriasis in combination with glycerine of starch and green soap.

7.—JUNIPERUS SABINA. THE SAVIN.

Sabinæ Cacumina.—Savin Tops.—The fresh and dried tops of Juniperus Sabina (fig. 254). Collected in spring from plants cultivated in Britain.

Characters.—Twigs densely covered with minute imbricated adpressed green (or yellowish-green when dried) leaves, having on their back a large oval depressed central gland; odour

when rubbed or bruised strong and peculiar; taste acrid, bitter, and disagreeable.

Microscopical examination of savin in coarse powder will

FIG. 254.—Juniperus Sabina. The Savin, in Fruit.

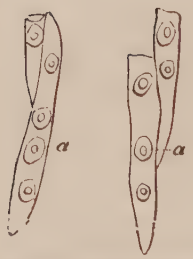


FIG. 255.—Juniperus Sabina. Woody fibres (magnified) of Savin, showing (*a*, *a*) the pores.

FIG. 256.—Magnified extremity of the leaf of Savin, showing the subulate linear leaves.

FIG. 257.—Magnified extremity of the leaf of Yew, the Taxus Baccata, showing the linear leaves.

reveal in the woody fibres the circular pores (fig. 255) characteristic of the Gymnosperms; by the shape of the apex of the leaves, savin (fig. 256) may be distinguished from another

poisonous gymnospermous plant (fig. 257), viz. the Yew, the Taxus Baccata (fig. 258).

Dose, in powder.—4 to 10 grains.

Official Preparations.—Tinctura Sabinæ.—Tincture of Savin (savin tops, dried and coarsely powdered ; proof spirit. Prepared by maceration and percolation).

Dose.—20 minims to 1 fluid drachm.

Unguentum Sabinæ.—Ointment of Savin (fresh savin tops, bruised, yellow wax and benzoated lard).

Oleum Sabinæ.—Oil of Savin.—The oil distilled in Britain from the fresh tops of Juniperus Sabina.

Dose.—1 to 5 minims.

Characters.—Colourless or pale-yellow, with the odour of the plant, and an acrid, bitterish taste.

Fig. 258.—Taxus Baccata.
a, young fruit ; *b*, older fruit.

Therapeutics.—The action of savin is that of an irritant, both internally and externally ; it apparently acts powerfully upon the uterus as an emmenagogue. It is employed externally as an ointment, to keep up discharge from a blistered surface ; and is sometimes exhibited internally in certain cases of amenorrhœa which are unaccompanied by congestion of the pelvic organs. In large doses it has been used (often criminally) to produce abortion ; its administration is attended with extreme danger.

8.—PINUS BALSAMEA. BALM OF GILEAD FIR.

Terebinthina Canadensis.—CANADA TURPENTINE.—The TURPENTINE obtained by puncture or incision of the bark of the trunk and branches of Pinus Balsamea (fig. 259).

FIG. 259.—Pinus Balsamea. Balm of Gilead Fir.

From Canada.

Characters.—A pale-yellow and faintly greenish transparent oleo-resin, of the consistence of thin honey, with a peculiar agreeable terebinthinate odour, and a slightly bitter, feebly acrid taste; by exposure to the air drying very slowly into a transparent adhesive varnish; solidifying when mixed with a sixth of its weight of magnesia.

Dose.—20 to 30 grains.

Contained in *Charta Epispastica* and *Collodium Flexile.*

Therapeutics.—Similar to other turpentines. Seldom used as a medicine.

9.—PINUS; AUSTRALIS, TÆDA, PINASTER, SYLVESTRIS.

Terebinthinæ Oleum.—OIL OF TURPENTINE.—The OIL distilled, usually by the aid of steam, from the oleo-resin (turpentine) obtained from Pinus Australis (fig. 262), Pinus Tæda (fig. 261) and sometimes Pinus Pinaster (fig. 260), and Pinus Sylvestris (fig. 251); rectified if necessary. Imported from France and America.

Characters.—Limpid, colourless, with a strong peculiar odour (which varies in different kinds), and a pungent and bitter taste. It is inflammable; dissolves caoutchouc, sulphur, phosphorus, fats, and resins, and is itself soluble in alcohol and ether. With hydrochloric acid gas it forms two artificial camphors, $C_{10}H_{16}HCl$ and $C_{10}H_{16}2HCl$. With water it forms three hydrates, viz. *Terpinol*, $(C_{10}H_{16})_2H_2O$, *Terpine*, $C_{10}H_{16}$, $2H_2O$, and *Terpine Hydrate*, $C_{10}H_{16},3H_2O$.

Dose.—10 minims to 4 fluid drachms.

Official Preparations.—Confectio Terebinthinæ.—Confection of Turpentine (oil of turpentine; liquorice root, in powder; clarified honey).

Dose.—60 to 120 grains.

Enema Terebinthinæ.—Enema of Turpentine (oil of turpentine and mucilage of starch).

Linimentum Terebinthinæ.—Liniment of Turpentine (soft soap is mixed with distilled water, and camphor is dissolved in oil of turpentine; these fluids are then rubbed together until mixed thoroughly).

Linimentum Terebinthinæ Aceticum.—Liniment of

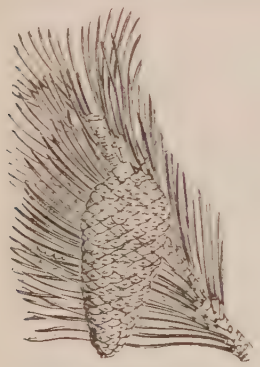


Fig. 260.—Pinus Pinaster.

Fig. 261.—Pinus Tæda.

Turpentine and Acetic Acid (oil of turpentine, glacial acetic acid, and liniment of camphor).

Unguentum Terebinthinæ.—Ointment of Turpentine (oil of turpentine; resin, in coarse powder; yellow wax, and prepared lard).

Therapeutics.—Internally, oil of turpentine in small doses becomes absorbed and exerts a stimulant, astringent, and antispasmodic action. It acts especially on the kidneys, causing diuresis and imparting to the urine an odour resembling that of violets. In large doses it produces strangury, the mucous membrane of the urinary organs being influenced in the same manner as when copaiba is employed. Turpentine in fairly large doses acts as a purgative, and is very useful for

destroying intestinal worms. It is sometimes given in hysteria ; but is used chiefly as an enema.

Externally the oil is a powerful rubefacient, and even vesicant when the vapour is confined ; when administered as an enema it may produce both stimulant and purgative effects. The turpentine liniments are applied to chronically inflamed and painful parts, or employed as fomentations (sprinkled on hot flannel) in painful conditions of the abdomen.

10.—PINUS AUSTRALIS. THE SWAMP PINE. PINUS TÆDA. THE FRANKINCENSE PINE.

Thus Americanum.—COMMON FRANKINCENSE.—The concrete TURPENTINE which is scraped off the trunks of Pinus Australis (fig. 262) and Pinus Tæda (fig. 261). From the Southern States of North America.

FIG. 262.—Pinus Australis. The Swamp Pine.

Characters.—When fresh, a softish, yellow, opaque, tough solid, having the odour of crude American turpentine, but by keeping it becomes dry and brittle, darker in colour, and of a milder odour.

Contained in *Emplastrum Picis.*

Cupuliferæ.

1.—QUERCUS LUSITANICA OR INFECTORIA. THE DYER'S OAK.

Galla.—GALLS.—EXCRESCENCES on Quercus Lusitanica or Infectoria caused by the puncture and deposit of an egg or eggs of Cynips Gallæ Tinctoriæ. Grows chiefly in Asia Minor.

Characters.—Hard, heavy, subglobular bodies, varying from half an inch to three-fourths of an inch or more in diameter, tuberculated on the surface, the tubercles and intervening spaces being smooth; of a dark bluish-green, or dark olive-green colour on the surface, yellowish or brownish-white within, with a small central cavity; taste intensely astringent, succeeded by some degree of sweetness. Contain about 35 per cent. of *Tannic Acid*, 5 per cent. of *Gallic Acid*, with *Ellagic Acid* and gummy and extractive matters, lignin, salts, &c.

Official Preparations.—Acidum Gallicum and Acidum Tannicum (see pp. 72, 73).

Tinctura Gallæ.—Tincture of Galls (galls, in No. 40 powder; proof spirit). Prepared by maceration and percolation. Here the tannic acid after a time is converted into gallic acid.

Dose.—½ to 2 fluid drachms.

Unguentum Gallæ.—Ointment of Galls (galls, in fine powder, mixed thoroughly with benzoated lard).

Unguentum Gallæ cum Opio.—Ointment of Galls and Opium (ointment of galls and opium, in powder; mixed thoroughly).

Therapeutics.—The efficacy of gall nuts is entirely due to the tannic and gallic acids they contain. The action of these acids has been already described (see p. 73).

2.—QUERCUS ROBUR. THE COMMON OAK.

Quercûs Cortex.—Oak Bark.—The dried bark of the

Fig. 263.—Quercus Robur.

small branches and young stems of Quercus Robur (figs. 263, 264). Collected in spring, from trees growing in Britain.

Characters.—In quills covered with a smooth shining silvery or ash-grey, variegated with brown, corky layer, cinnamon-brown or brownish-red on the inner surface, and striated longitudinally. Fracture tough and fibrous and taste strongly astringent. Contains *Tannic* and *Gallic Acids*, together with a substance *Pectin* and *Querci-tannic Acid*. This last acid differs from tannic acid in not yielding gallic acid when oxidised.

FIG. 264. Quercus Robur. The Common Oak. *a*, Leaves and male flowers, *b*, male flowers, showing the lax pendulous catkins; *c*, female flowers and leaves; *d*, nut, 1-celled, 1-seeded, coriaceous and hemispherical, surrounded at the base by the cupula (acorn cup).

The amount of tannic acid varies much according to the age of the branches from which the bark is taken.

Official Preparation.—DECOCTUM QUERCÛS.—Decoction of Oak Bark (oak bark, bruised, and distilled water, boiled and strained).

Therapeutics.—Oak bark is rarely used except as an external astringent. The decoction is useful in the form of lotion, gargle, or injection, in leucorrhœa, and in relaxed sore throat. It may be used internally in all cases where tannic acid is indicated.

Euphorbiaceæ.

1.—CROTON ELUTERIA. THE CASCARILLA.

Cascarillæ Cortex.—Cascarilla Bark.—The dried bark of Croton Eluteria (fig. 265). From the Bahama Islands.

Characters.—In quills from two to three or more inches in length, and from one-sixth to half an inch in diameter, covered with a dull brown corky layer, easily separable, and which is more or less coated with a silvery or greyish-white lichen; breaks with a short brown resinous fracture; is warm and nauseously bitter to the taste; and emits a fragrant aromatic odour when burned. Is said to contain a neutral bitter principle (*Cascarillin*), with some tannic acid, colouring matter, and a *volatile oil.*

Fig. 265.—Croton Eluteria. The Cascarilla Flower and leaf.

Official Preparations.—Infusum Cascarillæ.—Infusion of Cascarilla (cascarilla bark, in No. 20 powder, and boiling distilled water).

Dose.—1 to 2 fluid ounces.

Tinctura Cascarillæ.—Tincture of Cascarilla (cascarilla bark, in No. 40 powder, and proof spirit. Prepared by maceration and percolation).

Dose.—½ to 2 fluid drachms.

Therapeutics.—This drug is an aromatic stomachic and tonic, and probably a stimulating expectorant. It is useful in dyspepsia, and in some forms of chronic bronchitis, especially when accompanied by excessive expectoration; also in recovery from acute diseases.

2.—CROTON TIGLIUM.

Crotonis Oleum.—Croton Oil.—The oil expressed in Britain from the seeds of Croton Tiglium (figs. 266, 267). Grows in the East Indies.

Characters.—Brownish-yellow to dark reddish-brown, fluorescent, with a viscid consistence which age increases, having a faint, peculiar, somewhat rancid, disagreeable odour, and acrid oily taste. Entirely soluble in alcohol. Contains *Tiglinic* and *Crotonic Acids*. The seeds are

Fig. 266.—Croton Tiglium. Leaf and seeds.

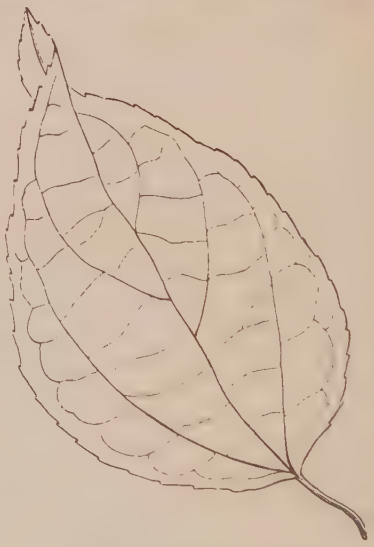


Fig. 267.—Croton Tiglium. The leaf.

of a dull cinnamon-brown colour, and resemble castor oil seeds, but are rougher and smaller, and are not marbled on their surface.

Doses.—$\frac{1}{3}$ to 1 minim placed on the tongue; or formed into a pill with crumb of bread; as an adjunct, $_1{}^1{}_2$ of a drop and upwards.

Official Preparation.—Linimentum Crotonis.—Liniment of Croton Oil (croton oil, oil of cajuput, and rectified spirit).

Therapeutics.—An intensely powerful, irritant, drastic purgative, frequently causing vomiting and nausea. It has been given in obstinate constipation and in some cerebral affections, as apoplexy. In very minute quantities it may be used as an ordinary purgative. A few minims added to some ounces of

castor oil, greatly increases the activity of the latter and diminishes the acridity of the former oil.

Externally, croton oil gives rise to pustulation; it is a valuable counter-irritant when diluted with soap liniment or olive-oil.

Adulteration.—Other fixed oils, as castor oil, might be added. These would be difficult to detect

3.—MALLOTUS PHILIPPINENSIS.

Kamala.—KAMALA.—A POWDER which consists of the minute glands and hairs obtained from the surface of the fruits of Mallotus Philippinensis (fig. 268). Imported from India.

FIG. 268.—Mallotus Philippinensis. The Kamala.

Characters.—A fine granular mobile powder, of a brick-red or madder colour; nearly tasteless and inodorous; it is with difficulty mixed with water, but when boiled with alcohol the greater part is dissolved, forming a red solution. Ether dissolves most of it; microscopically it consists of spherical flattened or depressed garnet-red glands with wavy surfaces, mixed with nearly colourless thick-walled stellate hairs. It should be free from sand or earthy impurities. Consists of a resin, *Rottlerin*, with traces of *tannic acid*, *gum*, and *volatile oil.*

Dose.—30 grains to $\frac{1}{4}$ ounce, in thick gruel or honey.

Therapeutics.—A powerful anthelmintic; much used in India for the treatment of tapeworm. It generally purges freely.

4.—RICINUS COMMUNIS. THE CASTOR-OIL PLANT.

Ricini Oleum.—CASTOR OIL.—The OIL expressed from the seeds of Ricinus Communis (fig. 269). Imported chiefly from Calcutta. Growing in the East Indies and America.

Characters.—Viscid, colourless, or pale straw-yellow, having a slightly nauseous odour and mild taste at first, but subsequently unpleasant and acrid. Differs from most other fixed

Fig. 269.—Ricinus Communis. The Castor-oil Plant.
a, stamens; *b*, anther; *c*, stigmas; *d*, capsule; *e*, seed; *f*, embryo.

oils in being completely soluble in one volume of alcohol and two volumes of rectified spirit.

Contains three oily acids, *Ricinic*, *Ricin-Oleic*, and *Ricin-Stearic*, combined with *Glycerine*. The seeds are about the size of small beans, oval, compressed, obtuse at the ends,

shining and smooth on the surface, of a light-ash colour, and are marbled with veins and dark spots. Their action is very active and even dangerous.

Dose.—1 to 8 fluid drachms. Castor oil is often given, floating on some fluid, in the form of an emulsion, with some aromatic, or in gelatine or membranous capsules.

Official Preparation.—MISTURA RICINI OLEI.—Castor Oil Mixture (castor oil, oil of lemon, oil of cloves, solution of potash, syrup and orange-flower water mixed).

Dose.—½ to 2 fluid ounces.

This mixture has been described as a solution of scented soap. To most palates it is even more nauseous than castor oil itself.

Castor oil is used in the preparation of *Collodium Flexile*, *Linimentum Sinapis Compositum*, and *Pilula Hydrargyri Subchloridi Composita.*

Therapeutics.—A quick, but mild purgative, causing little disturbance of the system beyond the evacuation of the bowels. It is given to delicate persons, and used in gastritis, enteritis, dysentery, and cystitis.

Adulterations.—Other fixed oils, which are difficult to detect, since when they are mixed with castor oil they are rendered somewhat soluble in alcohol.

Lauraceæ.

1.—CINNAMOMUM CAMPHORA.

Camphora.—CAMPHOR ($C_{10}H_{16}O$).—A STEAROPTENE (concrete volatile oil) obtained from the wood of Cinnamomum Camphora (fig. 270). Imported in the crude state from China and Japan, and purified by sublimation in this country.

Characters.—Solid, colourless, translucent, somewhat tough, crystalline masses; presenting numerous fissures when of any size. Readily powders when moistened with rectified spirit, ether, or chloroform. It has a powerful penetrating odour and a pungent somewhat bitter taste, followed by a sensation of cold; floats on water, burns readily with a bright smoky flame, volatilises somewhat rapidly even at ordinary temperatures; is

very slightly soluble in water, but readily so in chloroform, rectified spirit, and ether. Sublimes entirely when heated.

When heated with nitric acid, camphor is oxidised to *Camphoric Acid* ($C_{10}H_{16}O_4$) and *Camphoretic Acid* ($C_{10}H_{14}O_7$). When heated in alcohol with caustic potash it is converted into *Camphic Acid* ($HC_{10}H_{15}O_2$) and *Camphol* ($C_{10}H_{18}O$), or Borneo Camphor.

Dose.—1 to 10 grains.

Official Preparations.—Aqua Camphoræ.—Camphor Water (camphor ($\frac{1}{2}$ ounce), crushed, is enclosed in a muslin bag, attached to a piece of glass by means of which it may be kept at the bottom of a bottle containing distilled water (1 gallon).

Fig. 270.—Cinnamomum Camphora. Camphor.

The mouth of the bottle is closed, and maceration is continued for a few days. The solution is poured off as required). It is stated to contain about half a grain of camphor to the ounce.

Dose.—1 to 2 fluid ounces. Used in preparing the *Hypodermic Injections* of *Apomorphine* and of *Ergotine*.

Linimentum Camphoræ.—Liniment of Camphor (camphor dissolved in olive oil).

Used in *Linimenta: Chloroformi*, *Hydrargyri*, and *Terebinthinæ Aceticum*.

Linimentum Camphoræ Compositum.—Compound Liniment of Camphor (camphor and oil of lavender dissolved in rectified spirit, and strong solution of ammonia added).

Spiritus Camphoræ.—Spirit of Camphor (camphor dissolved in rectified spirit). =(1 in 10).

Dose.—10 to 30 minims suspended in water by means of mucilage.

Tinctura Camphoræ Composita.—Compound Tincture of Camphor (opium, in powder; benzoic acid; camphor; oil of anise; proof spirit). Contains the soluble matter of a quarter of a grain of opium in 1 fluid drachm.

Dose.—15 minims to 1 fluid drachm.

Camphor is contained in *Unguentum Hydrargyri Compositum*, and in many *Liniments*.

Therapeutics.—This substance is poisonous to the lowest forms of vegetable and animal life; acts like a narcotic poison upon insects and many animals. It is antiseptic and arrests protoplasmic movement. When applied in substance it is a powerful irritant to mucous membranes and raw surfaces.

When camphor has been administered in very large doses, *i.e.* 30 to 100 grains, to the human subject, dangerous symptoms have arisen, such as giddiness, vomiting, coldness of the extremities, muscular debility, feeble pulse, loss of consciousness, and even death. Medicinally employed, it is stimulant and antispasmodic, and has apparently some antipyretic influence. It has been given in choleraic diarrhœa and adynamic fevers; in some spasmodic affections, as whooping cough, epilepsy, and chorea; in hysteria; in chordee; as a calmative in disorders associated with sexual excitement. Externally it is applied as a stimulant to stiff and painful parts. Inhalations of camphor have been advocated for coryza.

Adulterations.—Borneo Camphor, from Dryobalanops Camphora, a plant of the order Guttiferæ, is sometimes substituted for the true camphor. It is less volatile, heavier than water, and more opaque than the true camphor.

An artificial camphor can be formed by the passage of hydrochloric acid gas through the volatile oil of turpentine.

2.—CINNAMOMUM ZEYLANICUM. THE CINNAMON TREE.

Cinnamomi Cortex.—CINNAMON BARK.—The dried inner BARK of shoots from the truncated stocks or stools of the cultivated cinnamon tree, Cinnamomum Zeylanicum (fig. 271). Imported from Ceylon, and distinguished in commerce as Ceylon Cinnamon.

Characters.—In closely rolled quills each about $\frac{3}{8}$ of an inch in diameter, and containing several small quills. It is

FIG. 271.—Cinnamomum Zeylanicum. The Cinnamon Tree.

thin, brittle, splintery, moderately pliable, dull yellowish-brown externally; marked with scars or holes and faint shining wavy lines; inner surface darker brown, having a fragrant odour and a warm sweet aromatic taste. Contains a notable amount of *tannic acid*; should not contain starch.

Official Preparations.—AQUA CINNAMOMI.—Cinnamon Water (cinnamon bark, bruised, mixed with water and distilled).

Dose.—1 to 2 fluid ounces.

Contained in *Mistura Cretæ*, *Guaiaci*, and *Spiritus Vini Gallici*.

PULVIS CINNAMOMI COMPOSITUS.—Compound Powder of Cinnamon (cinnamon bark, cardamom seeds, and ginger mixed in powder).

Dose.—3 to 10 grains.

Contained in *Pilula Aloes et Ferri* and *Pilula Cambogiæ Composita*.

Tinctura Cinnamomi.—Tincture of Cinnamon (cinnamon bark, in coarse powder, and rectified spirit. Prepared by maceration and percolation).

Dose.—½ to 2 fluid drachms.

Cinnamon bark is also contained in *Decoctum Hæmatoxyli*, *Tinctura Cardamomi Composita*, *Tinctura Lavandulæ Composita*, and several other preparations.

Cinnamomi Oleum.—Oil of Cinnamon.—The oil distilled from Cinnamon Bark.

Characters.—Yellowish when recent, gradually becoming cherry-red, from the formation (by oxidation) of a resinous matter and *Cinnamic Acid*, having the odour and taste of cinnamon bark. Sinks in water. Contains *Cinnamyl Hydride*, and a small quantity of a hydrocarbon ($C_{10}H_{16}$).

Dose.—1 to 4 minims.

Official Preparations.—Spiritus Cinnamomi.—Spirit of Cinnamon (oil of cinnamon dissolved in rectified spirit).

Dose.—½ to 1 fluid drachm.

Contained in *Acidum Sulphuricum Aromaticum*.

Therapeutics.—Stimulant, aromatic, and carminative; somewhat astringent; used as an adjunct in diarrhœa. The oil may be given in flatulence, and may be also added to purgatives.

Adulterations.—The bark of Chinese Cinnamon (from Cinnamomum Cassiæ); this is known by its greater roughness and thickness, and by its less aromatic odour and taste.

3.—NECTANDRA RODIÆI. THE GREENHEART TREE.

Nectandræ Cortex.—Bebeeru Bark.—The dried bark of Nectandra Rodiæi. Imported from British Guiana.

Characters.—In flattish heavy pieces, from one to two feet long, from two to six inches broad, and a quarter of an inch or more thick. External colour greyish-brown, internal dark cinnamon-brown and with evident longitudinal striæ. Very hard

and brittle, its fractured surface presenting a coarse-grained appearance. Taste strongly and persistently bitter, with considerable astringency. Contains *Tannic Acid* and two alkaloids, *Beberina* and *Nectandrina*.

Official Preparation.—Beberinæ Sulphas.—Sulphate of Beberine prepared from Nectandra or Bebeeru Bark. Probably a mixture of sulphates of beberine, $C_{36}H_{42}N_2O_6$, nectandrine, $C_{40}H_{46}N_2O_8$, and other alkaloids (bebeeru bark, in coarse powder; sulphuric acid; slaked lime; solution of ammonia; rectified spirit; diluted sulphuric acid; water; and distilled water).

Characters.—In dark-brown thin translucent scales; yellow when in powder, with a strong bitter taste. Soluble in water and in alcohol. Its watery solution gives with caustic soda a *yellowish-white* precipitate of Beberina.

Dose.—1 to 10 grains.

Therapeutics.—The Nectandra bark is seldom given. The sulphate of beberina has been used as a substitute for quinine; in antiseptic power it somewhat resembles the cinchona alkaloids (even in very small quantities it prevents the development of bacteria); it is stated to be useful in periodic headaches. It may act as a tonic, but is a very imperfect substitute for quinine. Cases of ague, which have yielded rapidly to the action of quinine, have been unaffected by sulphate of beberina even when the drug has been given in doses large enough to produce gastric disturbance.

4.—SASSAFRAS OFFICINALE. THE SASSAFRAS TREE.

Sassafras Radix.—Sassafras Root.—The dried root reduced to chips or shavings of Sassafras Officinale. Grows in the United States and in Canada.

Characters.—In large branched pieces more or less covered with bark. Bark rough and externally greyish-brown or rusty brown; internally smooth, glistening, and rusty-brown, with an agreeable aromatic odour and a peculiar aromatic somewhat astringent taste. Wood soft, light in weight, greyish-yellow or

greyish-red; odour and taste similar to the bark, but more feeble.

Contains a little tannin, red colouring matter, and a volatile oil consisting of a hydrocarbon, *Safren*, sassafras camphor or *Sassafrol*, and an isomer, *Safrol*.

Sassafras Root is contained in *Decoctum Sarsæ Compositum*.

Therapeutics.—Diaphoretic and stimulant, seldom given alone; may be used in skin diseases, syphilis, and chronic rheumatism. The volatile oil (Oleum Sassafras) may be given in doses of 1 to 5 minims.

Liquidambaraceæ.

LIQUIDAMBAR ORIENTALIS.

Styrax Præparatus.—Prepared Storax.—A balsam prepared from the inner bark of Liquidambar Orientalis (fig. 272). Purified by solution in spirit, filtration, and evaporation. Obtained from the bark in Asia Minor.

Fig. 272.—Liquidambar Orientalis.

Characters.—A semi-transparent brownish-yellow semi-fluid balsam, about the consistence of thick honey, with a strong odour and balsamic taste; boiled with solution of bichromate of potassium and sulphuric acid, it evolves an odour resembling that of bitter almonds. Heated in a test-tube on the vapour-bath it becomes more liquid, but gives off no moisture.

Contains a volatile oil (*Styrol*), *Cinnamic Acid*, a principle termed *Styracin*, and a peculiar resin.

Dose.—5 to 20 grains.

Prepared Storax is contained in *Tinctura Benzoini Composita*.

Therapeutics.—The action of Storax is similar to that of the balsams of Peru and Tolu.

Moraceæ.

1.—FICUS CARICA. THE FIG.

Ficus.—Fig.—The dried fruit (Syconus) of Ficus Carica (figs. 273, 274). Imported from Smyrna. A native of Asia.

Characters.—The fig consists of the enlarged hollow suc-

Fig. 273.—Ficus Carica.

Fig. 274.—Ficus Carica. The Fig. A, receptacle: *a a*, bracteal scales; *b*, umbilicus. B, longitudinal section of receptacle: *a*, flowers, seated on *b*, the inner side of the receptacle. C, female flower. D, section of female flower. E, male flower.

culent receptacle, bearing very numerous seed-like achenes on its inner surface. It is irregular in form, compressed, soft, tough, more or less translucent, brownish or yellowish, and

covered with a saccharine efflorescence. Odour fruity and pleasant; taste luscious.

Figs contain chiefly saccharine and mucilaginous matters. They are used in preparing *Confectio Sennæ*.

Dose.—Ad libitum.

Therapeutics.—Nutritive, laxative, and demulcent. For their laxative property, figs are sometimes used as an article of diet.

2.—MORUS NIGRA. THE MULBERRY.

Mori Succus.—MULBERRY JUICE.—The JUICE of the ripe fruit of Morus Nigra (fig. 275). Cultivated in Britain. Native of Persia.

Characters.—Of a dark violet or purple colour, with a faint odour, and a refreshing acidulous saccharine taste.

FIG. 275.—Morus Nigra. The Mulberry.

Official Preparation.—SYRUPUS MORI.—Syrup of Mulberries (mulberry juice heated to boiling and filtered; refined sugar is dissolved in the filtered liquid, and rectified spirit added).

Dose.—1 fluid drachm or more.

Therapeutics.—Mulberry juice is refrigerant and may be given in fevers. The syrup is frequently used as a colouring agent.

Myristicaceæ.

MYRISTICA FRAGRANS. THE NUTMEG.

Myristica.—NUTMEG.—The dried SEED of Myristica Fragrans (figs. 276-278) divested of its hard coat or shell. Cultivated extensively in the Banda Islands of the Malayan Archipelago.

Characters.—Oval or roundish, rarely exceeding an inch in length, externally greyish-brown and marked with reticulated furrows, internally greyish-red, with darker brownish-red veins. It has a strong and pleasantly aromatic odour, and an agreeably aromatic warm and bitterish taste.

Dose, in powder.—5 to 15 grains.

Nutmeg is an ingredient of *Pulvis Catechu Compositus*, *Pulvis Cretæ Aromaticus*, *Spiritus Armoraciæ Compositus*, and *Tinctura Lavandulæ Composita.*

Fig. 276. - Myristica Fragrans. The Nutmeg.

Myristicæ Oleum.—Volatile Oil of Nutmeg.—The oil distilled in Britain from nutmeg.

Characters. — Colourless or straw-yellow, having the odour and taste of nutmeg.

Dose.—1 to 4 minims.

Official Preparation.—Spiritus Myristicæ.—Spirit of Nutmeg (volatile oil of nutmeg dissolved in rectified spirit). =(1 in 50).

Dose.—½ to 1 fluid drachm. Contained in *Mistura Ferri Composita.*

Volatile oil of nutmeg is also contained in *Pilula Aloes Socotrinæ*, and *Spiritus Ammoniæ Aromaticus.*

Fig. 277. True or Round Nutmeg in the shell surrounded by its mace. From a specimen preserved wet.

Fig. 278. - Long or Wild Nutmeg in the shell surrounded by its mace. From a dry commercial specimen.

Myristicæ Oleum Expressum.—Expressed Oil of Nutmeg.—A concrete oil obtained by means of expression and heat from nutmeg.

Characters.—Of an orange-brown or orange-yellow colour, more or less mottled, of firm consistence, and having a fragrant odour like that of nutmeg. It is commonly known as "Butter of Nutmeg," and contains the volatile oil and fatty acids, amongst them *Myristicin*, united with *glycerine* and *myristic acid.*

Used in the preparation of *Emplastrum Calefaciens* and *Emplastrum Picis.*

Therapeutics.—Nutmeg is a gentle aromatic stimulant and carminative. In large doses it is stated to possess marked narcotic properties, causing drowsiness, and even complete insensibility and stupor. It is more generally used as a flavouring agent than as a medicine. The expressed oil applied externally acts as a topical stimulant; it has been employed in chronic rheumatism.

Piperaceæ.

1.—PIPER CUBEBA. THE CUBEB PEPPER.

Cubeba.—CUBEBS.—The dried unripe full-grown FRUIT of Piper Cubeba. Cultivated in Java.

Characters.—Very like the black pepper, globular, wrinkled, blackish or greyish-brown, supported on a small stalk or tail of rather more than its own length, which distinguishes it from the black pepper, than which its colour is also lighter. Taste warm, aromatic, and somewhat bitter; odour strong, peculiar, and aromatic. Contains an inert substance (*Cubebin*), a resin yielding a volatile oil, and *Cubebic Acid.*

Dose, in powder.—30 to 120 grains.

Official Preparations.—TINCTURA CUBEBÆ.—Tincture of Cubebs (cubebs, in powder, and rectified spirit; prepared by maceration and percolation).

Dose. —½ to 2 fluid drachms.

CUBEBÆ OLEO-RESINA.—Oleo-resin of cubebs (cubebs in coarse powder and ether).

Dose.—5 to 30 minims.

Cubebæ Oleum.—OIL OF CUBEBS.—The OIL distilled in Britain from cubebs.

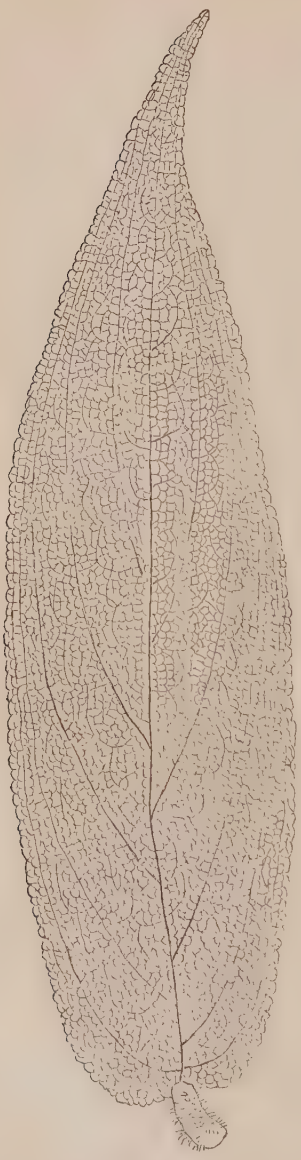


FIG. 279.—Leaf of Piper Angustifolium. The Matico.

Characters.—Colourless or greenish-yellow, having the odour and taste of cubebs.

Therapeutics.—This substance and its oil are used for their stimulant action upon the urethral, vesical, and other mucous membranes, from the surfaces of which they appear to have the power of arresting abnormal discharges. The oil is used in gonorrhœa and obstinate coryza. Special diuretic properties are attributed to the oleo-resin.

2.—PIPER ANGUSTIFOLIUM. THE MATICO PLANT.

Maticæ Folia.—MATICO LEAVES.—The dried LEAVES of Piper Angustifolium (fig. 279). Imported from Peru.

Characters.—From about four to eight inches long, oblong lanceolate, entire or minutely crenulated, greenish-yellow, veined and tesselated on the upper surface, the veins prominent beneath, and the depressions formed by them densely clothed with hairs; having an aromatic, bitterish taste, and an agreeable aromatic odour. As imported, the leaves are in a compressed state and are

mixed with the stem, flowers, and fruit. Matico contains a trace of tannin, a volatile oil, and *Arthantic Acid.*

Dose of the powder.—Internally, 30 to 60 grains.

Official Preparations.—INFUSUM MATICÆ.—Infusion of Matico (matico leaves, cut small, infused in boiling distilled water, and strained).

Dose.—1 to 4 fluid ounces.

Therapeutics.—Matico acts as a powerful styptic when the leaf or powder is applied to bleeding surfaces, as leech bites. The styptic power is supposed to be due to the mechanical structure of the leaf. Given internally, it is said to be astringent to the genito-urinary mucous membrane and rectum. Its action is similar to that of cubebs and black pepper.

3.—PIPER NIGRUM. BLACK PEPPER.

Piper Nigrum.—BLACK PEPPER.—The dried unripe FRUIT of Piper Nigrum (fig. 280). Chiefly imported from the East Indies. Grows in tropical countries as Sumatra and Java.

FIG. 280. - Piper Nigrum. Black Pepper.

Characters.—Roundish, generally about one-fifth of an inch in diameter; pericarp thin, brownish-black, wrinkled, and containing a hard, smooth, roundish, yellowish-brown or grey seed; odour aromatic; taste pungent and bitterish. When decorticated it forms WHITE PEPPER. Contains an *acrid resin*, a volatile oil, and *Piperin* ($C_{17}H_{19}NO_3$), isomeric with morphine, and decomposed by nitric acid into *Piperic Acid* ($HC_{12}H_9O_4$) and the alkaloid *Piperedine* ($C_5H_{11}N$), or *Amyl Nitride.*

Dose, in powder.—5 to 20 grains.

Official Preparation.—CONFECTIO PIPERIS.—Confection of Pepper (black pepper and caraway fruit, both in fine powder, and clarified honey, rubbed together).

Dose.—60 to 120 grains.

Pepper is also contained in *Confectio Opii* and *Pulvis Opii Compositus.*

Therapeutics.—Pepper is chiefly employed as a condiment. It is a stimulant stomachic, and is valuable in hæmorrhoids and in gonorrhœa, since it appears to influence the mucous membrane of the rectum and of the urethra. Pepper, or the oil, may be used externally as a rubefacient. The oil has been occasionally applied topically to relaxed sore throats.

Polygonaceæ.

RHEUM PALMATUM; OFFICINALE.

Rhei Radix.—Rhubarb Root.—The root, more or less deprived of the bark, sliced and dried, of Rheum Palmatum (fig. 281), Rheum Officinale, and probably other species, collected and prepared in China and Thibet. In this definition are included the Russian, the East Indian or Half-trimmed,

Fig. 281.—Rheum Palmatum. Known as the True Turkey Rhubarb.

Fig. 282.—Rheum Rhaponticum. Common Rhubarb.

and the Dutch-trimmed or Batavian Rhubarbs. Rhubarb is no longer brought overland through Russia, but is imported from Shanghai and Canton. The Common Rhubarb, Rheum Rhaponticum, is shown in fig. 282.

Characters.—The *Russian*, or so-called *Turkey* Rhubarb, occurs in trapezoidal, irregular-shaped, flat or cylindrical

angular pieces, the cortex having been removed by slicing; smooth and yellow externally, not turned reddish-brown by boric acid, showing the absence of turmeric: texture compact, fracture uneven, marbled red and grey, and finely gritty under the teeth, from the presence of raphides (needle-shaped or acicular crystals) of insoluble oxalate of calcium (fig. 283). The powder is bright buff-yellow; taste bitter, astringent, and disagreeable, tinging the saliva bright yellow; odour aromatic. The pieces are frequently bored with a hole in which are contained the remains of the cord used for suspending them to dry.

FIG. 283.—Crystals of Oxalate of Calcium in Russian Rhubarb.

The *East Indian* variety is not angular, but slightly rounded, with portions of the cortex adhering; externally red and veined, and not covered with yellow powder like the Russian. It is also denser, less gritty, and the powder is of a redder hue.

The *Batavian* variety is in round or flattened pieces, angular, and drilled with a hole. Its origin is probably the same as the Russian.

Rhubarb contains starch, tannic and gallic acids, oxalate of calcium, and an aperient principle termed *Chrysophanic Acid* ($C_{14}H_8O_4$) to which the yellow colour is due. Also a glucoside, *Chrysophane*, and a resin, *Phaoretin*, possessing purgative properties.

Dose of powdered rhubarb.—1 to 5 grains, as a stomachic; 10 to 30 grains as a purgative.

Official Preparations.—EXTRACTUM RHEI.—Extract of Rhubarb (rhubarb root, in No. 40 powder; proof spirit; distilled water. Prepared by maceration, percolation, and evaporation to a pilular consistence).

Dose.—5 to 15 grains.

INFUSUM RHEI.—Infusion of Rhubarb (rhubarb root, in thin slices, and boiling distilled water).

Dose.—1 to 2 fluid ounces.

PILULA RHEI COMPOSITA.—Compound Rhubarb Pill (rhubarb root; Socotrine aloes; myrrh; hard soap, all in powder,

mixed with oil of peppermint ; glycerine and treacle are added and the whole beaten into a uniform mass).

Dose.—5 to 10 grains.

Pulvis Rhei Compositus.—Compound Powder of Rhubarb (rhubarb root, in powder ; light magnesia ; ginger, in powder).

Dose.—20 to 60 grains.

Syrupus Rhei.—Syrup of Rhubarb (rhubarb root, in No. 20 powder ; coriander fruit, in No. 20 powder ; refined sugar ; rectified spirit ; distilled water).

Dose.—1 to 4 fluid drachms.

Tinctura Rhei.—Tincture of Rhubarb (rhubarb root, in No. 20 powder ; cardamom seeds, bruised ; coriander fruit, bruised ; saffron ; proof spirit. Prepared by maceration and percolation).

Dose.—1 to 2 fluid drachms, as a *stomachic* ; 4 to 8 fluid drachms, as a *purgative.*

Vinum Rhei.—Wine of Rhubarb (rhubarb root and canella bark, both in coarse powder).

Dose.—1 to 2 drachms.

Therapeutics.—Rhubarb in small doses is a slight astringent and stomachic. In larger doses it is purgative. The aperient action is generally followed by constipation. It causes no irritation of the alimentary canal. The perspiration, the milk, and the urine become coloured by the drug. It may be used in commencing diarrhœa dependent upon irritating matter, which is thus expelled, and the subsequent astringency of the drug proves very serviceable. It is also useful in cases of dyspepsia accompanied by constipation ; but when exhibited for habitual constipation, it should be combined with some other laxative. It is frequently usefully combined with magnesia or soda, especially when given to children, in the treatment of whose complaints it is notably valuable when in combination with a mercurial alterative. Externally it has been applied to indolent ulcers.

Adulterations.—Rhubarb is often extensively adulterated ; inferior varieties, as the English, being substituted for the Russian, &c. Turmeric may be present, which is reddened by

boric acid. In English rhubarb oxalate of calcium exists only in small quantities, and starch is generally in excess; the reverse is the case in the Chinese varieties.

Thymelaceæ.

DAPHNE MEZEREUM. MEZEREON. DAPHNE LAUREOLA. THE SPURGE LAUREL.

Mezerei Cortex.—MEZEREON BARK.—The dried BARK of Daphne Mezereum (fig. 284) or of Daphne Laureola (fig. 285).

FIG. 284.—Daphne Mezereum. The Mezereon.

FIG. 285.—Daphne Laureola. The Spurge Laurel.

Characters.—In long thin more or less flattened strips, which are usually folded or rolled into disks; or in small quills of various lengths. Inner surface whitish, silky, very tough, and covered externally by an olive brown, or somewhat reddish brown, readily separable corky layer; no marked odour; taste burning and acrid. Contains an *acrid resin*, a *volatile oil*, and a crystalline principle, *Daphnin*, which, when boiled with diluted sulphuric acid, yields *Daphnetin*.

Contained in *Decoctum Sarsæ Compositum.*

Official Preparation.—EXTRACTUM MEZEREI ÆTHEREUM.—Ethereal Extract of Mezereon (mezereon bark, cut small; rectified spirit; ether).

Contained in *Linimentum Sinapis Compositum.*

Therapeutics.—This substance is a powerful local irritant, and even vesicant. In large doses it causes purging and vomiting; in small doses it is a diaphoretic and diuretic. It

has been employed in syphilis, scrofula, chronic rheumatism, and skin diseases, but is seldom given internally in England, except in the form of *Decoctum Sarsæ Compositum.* It is used externally in the form of the *Linimentum Sinapis Compositum.*

CLASS II. ENDOGENÆ.

Graminaceæ.

1.—TRITICUM SATIVUM. THE COMMON WHEAT. ZEA MAYS. MAIZE. ORYZA SATIVA. RICE.

Amylum.—STARCH ($C_6H_{10}O_5$).—The STARCH procured from the grains of Common Wheat, Triticum Sativum (fig. 286); Maize, Zea Mays (fig. 287); and Rice, Oryza Sativa (fig. 288). Fig. 289 shows the Oat, and fig. 286 the Oat and Barley.

FIG. 286.—*a*, Triticum Sativum. The Common Wheat. *b*, Avena Sativa. The Oat. *c*, Hordeum Vulgare. The Barley.

Characters and Tests.—In fine powder, or in white columnar masses. When lightly rubbed in a mortar with a little cold distilled water, it is neither acid nor alkaline to test paper, and the filtered liquid does not become blue on the addition of

FIG. 287.—Zea Mays. The Maize. *a*. male flowers; *b*, *b*, *b*, *b*, female flowers. (The styles, which project beyond the enveloping sheaths, form a kind of tassel, popularly called the *silks*.) A, the large Red Maize.

FIG. 288.—Oryza Sativa. Rice.

solution of iodine. Mixed with boiling water and cooled, it gives a deep blue colour with iodine. Boiling is necessary, in order that the contents of the granules may swell and burst their envelope.

Microscopically (1) *Wheat Starch* shows a mixture of large and small granules, lenticular in form and marked by faint concentric striæ surrounding a central hilum.

(2) *Maize Starch*: Granules more uniform in size, often polygonal, somewhat smaller than the large granules of wheat starch, and having a very distinct hilum, but with no evident concentric striæ.

Fig. 289.—Avena Sativa. The White or Common Oat.

(3) *Rice Starch*: Granules extremely minute, almost uniform in size, polygonal; hilum small and without striæ.

Each granule consists of a thin external albuminous coat, which contains a substance termed Gelatinous Starch or Amiden.

When heated for some time with diluted sulphuric acid, starch is converted first into its soluble isomer, *Dextrine*, and subsequently into *Glucose* (grape-sugar). It is changed by nitric acid into oxalic acid.

Official Preparations. — Glycerinum Amyli.—Glycerine of Starch (starch, glycerine, and distilled water). Used in preparing the *Suppositoria: Acidi Carbolici cum Sapone; Acidi Tannici cum Sapone; Morphinæ cum Sapone.*

Mucilago Amyli.—Mucilage of Starch (starch and distilled water. Prepared by trituration and boiling). Contained in the *Enemata: Aloes; Magnesii Sulphatis; Opii; Terebinthinæ.*

Starch is also contained in *Pulvis Tragacanthæ Compositus.*

Therapeutics.—A mild nutritive demulcent; may be used in the form of the mucilage as a vehicle for enemata; combined with glycerine, it is useful as a sheathing in cases of chilblains and roughness of the skin.

Farina Tritici.—WHEATEN FLOUR.—The grain of wheat, Triticum Sativum (fig. 286). The common wheat, ground and sifted. Grows in Europe, and is cultivated over the greater part of the civilised world. It consists of *starch* and *gluten*, together with gum, sugar, mucilage, and water, and small quantities of phosphates of sodium, calcium, and magnesium. When kneaded under a stream of water, the *starch* is washed away and the *gluten* is left as a tenacious, adhesive, greyish-white mass. Thus prepared, gluten consists of *vegetable albumen*, insoluble in alcohol, and *vegetable fibrine*, soluble in alcohol.

Wheaten flour is contained in *Cataplasma Fermenti.*

Mica Panis.—CRUMB OF BREAD.—The soft part of bread made with wheaten flour. Contained in *Cataplasma Carbonis.*

Therapeutics.—Flour is used chiefly in the form of bread-crumb for giving consistency to pills; it is also used as an emollient cataplasma.

2.—HORDEUM DISTICHON.

Hordeum Decorticatum.—PEARL BARLEY.—The dried SEED of Hordeum Distichon (fig. 291) divested of its integu-

FIG. 290.—Hordeum Vulgare.

FIG. 291.—Hordeum Distichon.

ments. From plants cultivated in Britain. The Common Barley, Hordeum Vulgare, is shown in fig. 290.

Characters.—White, rounded, retaining a trace of the longitudinal furrow in which are the remains of the yellowish-brown integument; odour and taste farinaceous, like the cereal grains generally. Contains *gluten*, *starch*, *gum*, and *saccharine matters*.

Official Preparation.—Decoctum Hordei.—Decoction of

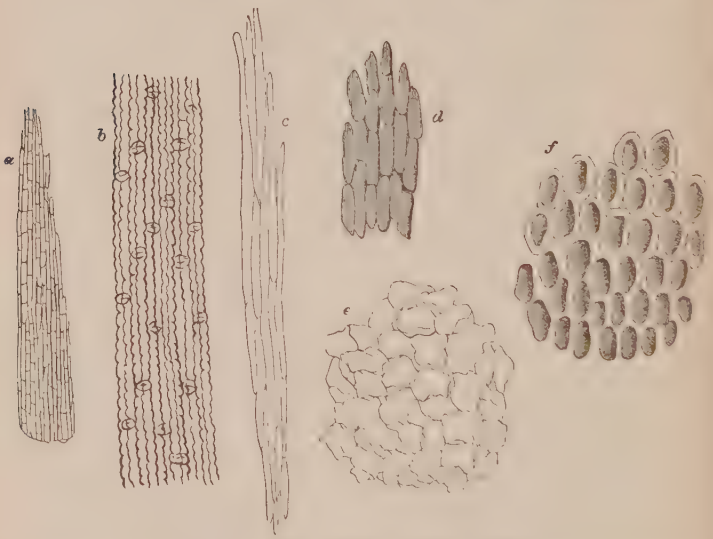


Fig. 292.—Microscopical appearances of Malt.

a, the *husk*, consisting of linear cells, bounded by serrated lines (*b*), and marked abundantly by round spaces which are the remains of breathing pores; *c*, cellular membrane, resembling fine parallel lines with indistinct appearances of serration; *d*, cellular membrane, consisting of regularly prismatic vesicles, arranged with much uniformity; *e*, cellular membrane, consisting of hexagonal cells with wavy margins; *f*, a thin skin, composed of minute roundish, angular cells of a slightly opaque appearance, which readily detach themselves, and, when examined with a quarter-inch objective, are seen to owe their appearance to molecular matter of extreme fineness, with which they are filled. Portions of this float abundantly in the water.

Barley (pearl barley well washed in cold water, the washings being rejected. The washed barley is then boiled with distilled water and strained).

Dose.—1 to 4 fluid ounces.

Therapeutics.—Only used in medicine in the form of the decoction, which is a mild nutritive and demulcent drink.

Malt or **Byne** is barley which has been made to germinate by moisture and warmth, *diastase* being formed, which converts the *starch* of the seed into *grape-sugar* and *gum* (*dextrine*). If the temperature does not exceed 100° F., the result is *pale malt*; above this, but not exceeding 180° F., the result is *amber malt*. These varieties of malt yield fermentable infusions. *Brown* or *blown malt*, dried at 260° F., is employed for communicating flavour; while the *roasted*, *burned*, or *high-dried malt*, which has been scorched, is used for colouring porter.

When malt is ground it separates into several distinct forms of tissue; and the characteristic marks of the husk present a sure means of detecting malt, either for identification or for detecting it as an adulteration in coffee or other substances in the state of powder (fig. 292). For Beer Yeast see p. 50.

Infusion of Malt is commonly called *sweet wort*. It contains starch, saccharine matter, glutinous matter, and mucilage, and is nutritive and laxative.

3—SECALE CEREALE. THE COMMON RYE. SECALE CORNUTUM. THE SPURRED RYE.

Ergota.—Ergot.—The sclerotium (compact mycelium or spawn) of a fungus, the Claviceps Purpurea (fig. 293), produced within the pales, and replacing the grain of the Secale Cereale (fig. 294), and thus establishing the Secale Cornutum (figs. 298, 299).

Characters.—Subcylindrical or obscurely triangular grains, tapering towards the ends, usually arched or curved; from one-third of an inch to an inch and a half in length, furrowed on each side longitudinally, but more particularly on the concave side; often cracked irregularly; of a violet-purple colour externally, whitish or pinkish-white within; fracture short; odour peculiar and disagreeable, more especially if the powder be triturated with solution of potash; taste rancid and mawkish. The grains somewhat resemble the spur of a cock, hence the name "Spurred Rye" (fig. 298). In the ergotised grain the bloom consists of the sporidia of the fungus.

The white dust, *sporidia*, found upon the surface of ergot

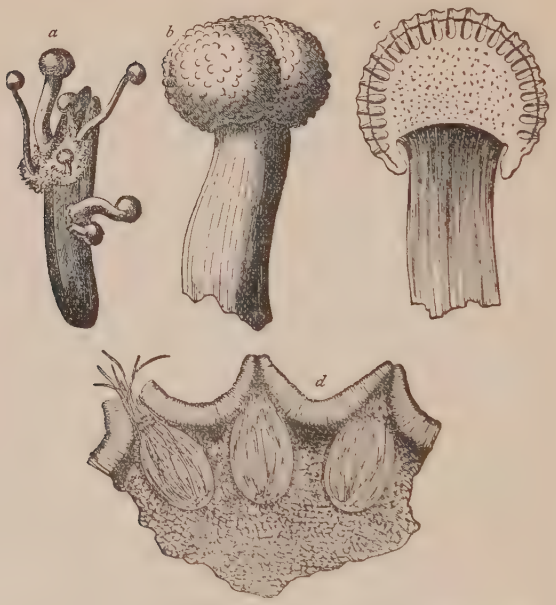


FIG. 293.—Specimens of Claviceps Purpurea. The Ergot Fungus.

a, an ergotised grain of Rye, giving rise to a tuft of Claviceps Purpurea (natural size); *b*, upper part of the stem and head, slightly magnified. The *perithecia* project in consequence of slight contraction of the substance; *c*, section of the same, showing the perithecia; *d*, a portion of the same, more highly magnified, showing the structure of the same, and the *asci* in the perithecia.

FIG. 294.—Secale Cereale. Common Rye. *a*, entire plant; *b*, *b*, paleæ; *c*, receptacle.

will produce the disease in any plant (grass?) if sprinkled in the soil at its roots. Grains of corn have been infected, *i.e.* ergotised, by immersing them in water in which the sporidia of the *Oidium Abortifaciens* were contained. The first appearance of the ergot is seen in the young grain and its appendages, becoming covered by a white coating consisting of multitudes of sporidia mixed with minute cobweb-like filaments. This coating, by extending over the whole of the grain, gives it a mildewed appearance.

If examined when about half grown, the ergot just begins to show itself above the palea, and presents a purplish-black

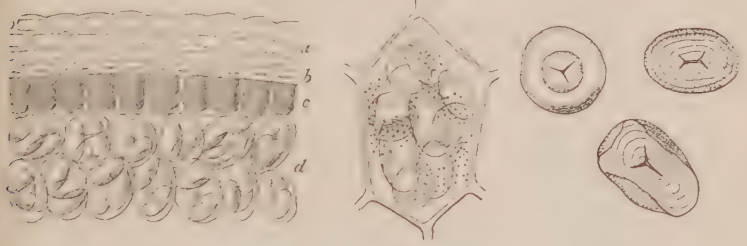


FIG. 295. FIG. 296. FIG. 297.

Microscopic appearance of a healthy grain of Rye (highly magnified).

FIG. 295.—A thin section of a ripe grain of Rye. *a*, seed-coat, consisting of three layers of thick-walled cells; *b*, inner seed-coat, consisting of a single layer of thick-walled cells; *c*, layer of gluten cells; *d*, cells of the albumen, filled with starch grains.

FIG. 296.—A single cell of the albumen more highly magnified, and showing the starch grains with which it is filled.

FIG. 297.—Grains of rye starch, very highly magnified (according to Corda).

colour. It has lost in part its white coating, and the production of filaments and sporidia has nearly ceased. At the upper part of the grain the coating presents a vermiform appearance, which has been described as constituting vermiform undulations (fig. 300, A, D, E.) These undulations are merely masses of sporidia. From this time the ergot increases very rapidly.

Microscopically, Ergot consists of three distinct parts :—

1. The *internal part* or *body* of the ergot, composed of hexagonal or rounded cellular tissue. The cells are similar to the normal cells of the albumen, but are considerably smaller, and contain, instead of starch, from one to three globules of oil (figs. 301 *d*, *e*, and 303).

2 The *violet* or *blackish* coat of the ergot : consists of a layer of longitudinally elongated delicate cells (fig. 301 *c*).

FIG. 298.—Secale Cornutum. Spurred Rye.

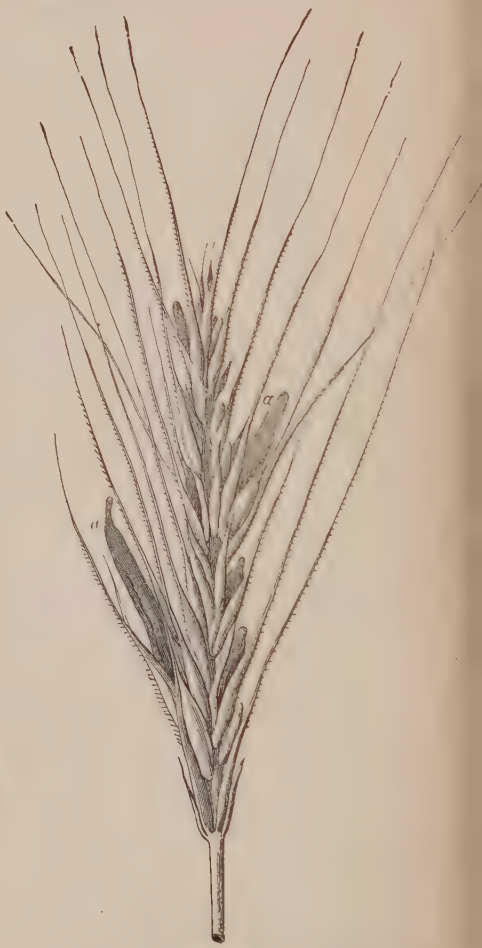


FIG. 299.—Tall-grown ear of Rye, strongly infected with Ergot, *a*, *a* (natural size)

3. The *bloom* : covers more or less the violet coat of the ergot ; resembles the bloom of plums ; and can be readily

wiped off. According to one authority it consists of the sporidia of the *Oidium Abortifaciens*; but according to another it presents two parts, viz. a layer of cylindrical undivided cells, and the *sporophores* or *basidia* (fig. 301 *b*) supporting the spores (fig. 301 *a* and 302). The microscopic appearances of a *healthy* grain of rye are shown in figs. 295–297.

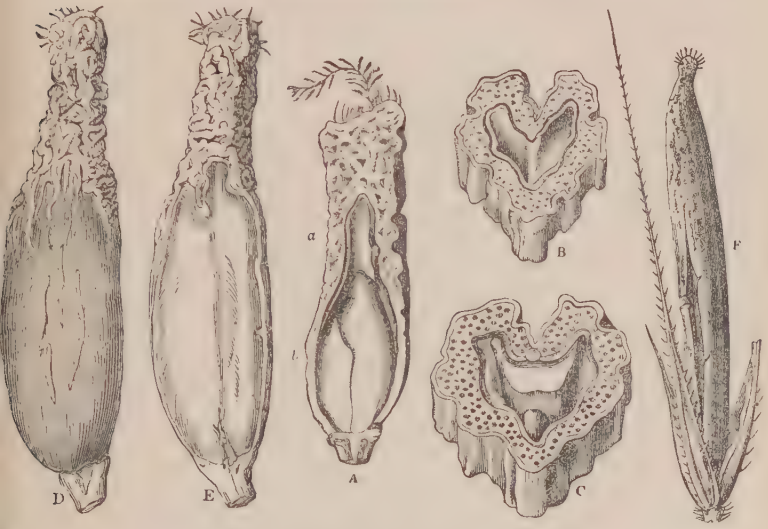


FIG. 300.—Secale Cornutum. Ergot of Rye.

A, side view of a longitudinal section of an infected grain, soon after fecundation, when the disease makes its first external appearance. Magnified eight times in diameter.
B, front view of a section of the above infected grain, cut at letter *a*. Magnified sixteen times in diameter.
C, the same, cut at letter *b*. Magnified sixteen times in diameter.
D, side view of an unripe but advanced ergoti-ed grain, at the upper part of which is the tuberculated portion, having a vermiform appearance and constituting the fungus called *Spacelia Segetum* by Léveillé.
E, longitudinal section of the grain.
F, a full-grown ergot within its floret, projecting considerably beyond the paleæ, and violet-black in colour. Magnified twice its diameter.

Ergot contains two bases, *Ergotine* and *Ecboline*, united with *Ergotic Acid*; also *Ergotinic Acid*, *Spacelinic Acid*, and an alkaloid, *Cornutine*. It also contains a fluid fixed oil, starch, gum, sugar, and resin. It is liable to be fed upon by a species of acarus, which sometimes destroys the whole interior.

Dose, in powder.—20 to 30 grains.

Official Preparations.—Extractum Ergotæ Liquidum.—Liquid Extract of Ergot (ergot, crushed and digested with distilled water, is pressed, strained, and evaporated by heat, and, when cold, rectified spirit is added). Used in preparing *Ergotinum*.

Dose.—10 to 30 minims.

Infusum Ergotæ.—Infusion of Ergot (ergot, crushed, and boiling distilled water added).

Dose.—1 to 4 fluid drachms.

Tinctura Ergotæ.—Tincture of Ergot (ergot, finely comminuted; proof spirit. Prepared by maceration and percolation).

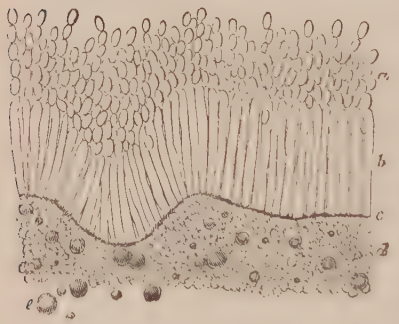


Fig. 301.

Fig. 302.

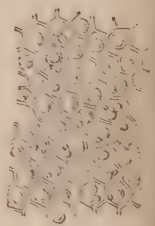


Fig. 303.

Microscopic appearance of ergotised Rye (highly magnified), according to Corda.

Fig. 301. Thin transverse section of ergot of rye. *a*, layer of spores; *b*, sporophores or basidia; *c*, epidermis of the receptacle; *d*, body of the receptacle; *e*, oil globules.
Fig. 302.—Spores of the fungus highly magnified.
Fig. 303.—Body of the receptacle, with the cells containing oil.

Dose.—10 to 30 minims.

Ergotinum.—Ergotin.—Purified extract of Ergot, commonly called Ergotin, Ergotine, or Bonjean's Ergotine (liquid extract of ergot evaporated to a syrupy consistence, and, when cold, mixed with rectified spirit).

Dose.—2 to 5 grains.

Official Preparation.—Injectio Ergotini Hypodermica. Hypodermic Injection of Ergotin (ergotin dissolved by stirring in camphor water) = (1 in 2.) The solution should be made as it is required for use.

Dose.—By subcutaneons injection, 3 to 10 minims.

Therapeutics.—Experiments have shown that ergot contracts the minute arteries by acting upon their muscular walls, thus increasing the systemic blood-pressure. Its action upon the arterioles is not prevented by previous division of the vaso-motor nerves. Injected into the jugular vein, it contracts the pulmonary arterioles, and thus suddenly lowers the blood-pressure in the systemic arteries. Ergot exerts a peculiar influence upon the uterus, causing powerful contractions, especially when the patient is pregnant. When taken in small quantities for some length of time, as in bread made from ergotised grain, a species of gangrene, similar to senile gangrene, is produced ; this effect is probably due to obstruction of the blood-supply by diminution of the calibre of the vessels. Large doses may produce nausea, vomiting, delirium, and even death.

Ergot is usually given to produce contraction of the uterus during labour, the contractions so caused differing from the natural ones in being continuous, and not alternating with relaxation. It is very valuable in menorrhagia, leucorrhœa, and in cases of amenorrhœa, when depending rather upon torpor of the uterus than upon anæmia. It is also useful in hæmorrhage after delivery. Lastly, ergot is a valuable remedy for arresting hæmorrhage from whatever cause produced ; it has been given in many other diseases, as in paraplegia.

Ergotin has been used subcutaneously for promoting the expulsion of intra-uterine submucous fibroids. It must be injected deeply into a muscle, as, unless it is administered in this manner, it may cause considerable local irritation.

4.—SACCHARUM OFFICINARUM. THE SUGAR CANE.

Saccharum Pu ificatum.—Refined Sugar ($C_{12}H_{22}O_{11}$). Pure cane sugar (Sucrose) (the purified crystalline juice) prepared from the stem of Saccharum Officinarum (fig. 304). From plants cultivated in the West Indies and other tropical countries.

Characters.—Compact crystalline conical loaves, known in commerce as lump sugar ; readily and completely soluble in

water, forming a clear, bright syrup, which yields no red or yellowish precipitate, or scarcely a trace, on heating it to near the boiling point of water with a little solution of sulphate of copper and excess of solution of potash—showing absence of glucose (grape sugar). A syrup is a very strong and viscid solution of sugar. When carefully crystallised from a strong solution with the addition of spirit, oblique four-sided prisms of "sugar-candy" are formed. Heated to 365° F. (185° C.) cane sugar melts and forms a viscid liquid, which, after sudden cooling, solidifies to "barley-sugar," an amorphous transparent substance. Sucrose is less soluble in water than glucose, into which substance it is readily converted by the action of weak acids or by fermentation.

FIG. 304.—Saccharum Officinarum. The Sugar Cane.

Official Preparation.—SYRUPUS.—Syrup (refined sugar and distilled water).

Dose.—Ad libitum.

Used in forming the other *syrups* and *lozenges* of the Pharmacopœia, and in numerous other preparations.

Therapeutics.—A demulcent; serviceable, from its sweet taste, for disguising remedies the flavour of which is unpleasant.

Adulterations.—Sugar may contain sulphate of calcium, and also lead in minute quantities derived from its mode of purification. These may prove harmless when sugar is employed medicinally, but not so when the substance is used daily in considerable quantities for domestic purposes.

Theriaca.—TREACLE.—The uncrystallised residue of the refining of sugar.

Characters.—A thick, fermentable syrup, of a golden colour, very sweet; not crystallising by rest or spontaneous evaporation. Fermentable with yeast, and by distillation yielding rum.

Tests.—Free from empyreumatic odour or flavour.

Treacle is used in the preparation of the following *Pilulæ:*

Aloes et Myrrhæ; Asafœtidæ Composita; Conii Composita; Ipecacuanhæ cum Scilla; Rhei Composita; Scillæ Composita; and also in the *Tinctura Chloroformi et Morphinæ.*

Therapeutics.—Treacle is a slight laxative in doses of a teaspoonful and upwards; it is frequently given in combination with sulphur.

Iridaceæ.

CROCUS SATIVUS.

Crocus.—SAFFRON.—The dried STIGMAS and top of the STYLE of Crocus Sativus (fig. 305). Imported from Spain, France, and Italy. Native of Greece and Asia Minor.

FIG. 305.—Crocus Sativus. The Saffron.

Characters.—Commercial saffron consists of three thread-like orange-red stigmas, thickened and tubular above, and jagged or notched at their extremities, and united below to the top of the yellow style. It is flexible, unctuous to the touch, has a powerful aromatic odour, and a bitter, somewhat aromatic taste. Rubbed on the wet finger, it leaves an intense orange-yellow tint. When pressed between the folds of white filtering paper it leaves no oily stain. The colouring matter is due to *Polychroit*, yielding, by decomposition, a volatile oil, and *Crocin*, a red colour, turned *blue* by sulphuric acid, and *green* by nitric acid. "Hay Saffron" is the name given to the finest saffron dried carefully without further preparation; when packed and pressed into parcels it is known as "Cake Saffron."

Dose (dried).—From 20 grains and upwards.

Official Preparation.—TINCTURA CROCI.—Tincture of Saffron (saffron and proof spirit. Prepared by maceration and percolation).

Dose.—½ drachm to 2 drachms.

Saffron is also contained in *Decoctum Aloes Compositum*;

Pilula Aloes et Myrrhæ; Pulvis Cretæ Aromaticus; Tinctura Cinchonæ Composita; Tinctura Opii Ammoniata; and *Tinctura Rhei.*

Therapeutics.—Saffron has a very slight stimulant action. It is chiefly employed as a colouring agent.

Adulterations.—Safflower and marigold petals, and saffron stamens are often present.

The so-called "Cake Saffron" is now chiefly composed of the safflower petals gummed together.

Liliaceæ.

1.—ALOE VULGARIS. ALOE PERRYI.

1. **Aloe Barbadensis.**—BARBADOES ALOES.—The JUICE when inspissated, which flows from the transversely cut bases of the leaves of Aloe Vulgaris. Imported from Barbadoes and the Dutch West Indian Islands; known in commerce as Barbadoes and Curaçoa aloes. A group of Aloes is shown in fig. 306.

FIG. 306.—Group of Aloes.

Characters.—Colour varying from deep reddish-brown or chocolate-brown to dark brown or almost black. Fracture generally dull and waxy; sometimes smooth and glassy. Opaque in masses, but translucent and of an orange-brown tint in thin films; powder dull olive-yellow; has a bitter, nauseous taste, and a strong, disagreeable odour. The Curaçoa variety is usually more glassy and translucent than the ordinary Barbadoes kind, and has a distinctive odour. Microscopically, a thin stratum moistened with rectified spirit exhibits numerous crystals. Nearly soluble in proof spirit.

Dose.—2 to 6 grains.

Official Preparations.—Enema Aloes.—Enema of Aloes (Barbadoes aloes, carbonate of potassium, mucilage of starch ; mixed and rubbed together).

Extractum Aloes Barbadensis.—Extract of Barbadoes Aloes (Barbadoes aloes, in small fragments, exhausted with boiling distilled water, and the solution evaporated to dryness).

Dose.—2 to 6 grains.

Pilula Aloes Barbadensis.—Pill of Barbadoes Aloes (Barbadoes aloes, in powder ; hard soap, in powder ; oil of caraway ; confection of roses ; beaten together until mixed thoroughly).

Dose.—5 to 10 grains.

Pilula Aloes et Ferri.—Pill of Aloes and Iron (sulphate of iron ; Barbadoes aloes, in powder ; compound powder of cinnamon ; confection of roses).

Dose.—5 to 10 grains.

Barbadoes Aloes is also contained in *Pilula Cambogiæ Composita ; Pilula Colocynthidis Composita ;* and *Pilula Colocynthidis et Hyoscyami.*

2.—**Aloe Socotrina.**—Socotrine Aloes.—The juice when inspissated which flows from the leaves of Aloe Perryi (figs.

Fig. 307.—Aloe Socotrina.

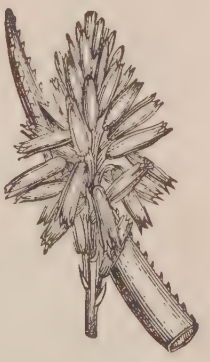


Fig. 308.—Aloe Perryi.

307, 308). Imported chiefly by way of Bombay and Zanzibar ; known in commerce as Socotrine and Zanzibar Aloes.

Characters.—Coloured various shades of reddish-brown, darkening by exposure to air; breaks usually with a smooth and resinous fracture, rarely with a rough and irregular one; in thin films transparent, ruby red, or orange-brown; powder bright tawny, reddish-brown; has a very bitter taste, and a strong and somewhat agreeable odour. Microscopically the thin stratum shows numerous crystals. In other cases it is opaque and liver-coloured, and is known as hepatic aloes.

Dose.—2 to 6 grains.

Official Preparations.—Extractum Aloes Socotrinæ.—Extract of Socotrine Aloes (Socotrine aloes, in small fragments, and boiling distilled water).

Dose.—2 to 6 grains.

This extract is also contained in *Extractum Colocynthidis Compositum.*

Decoctum Aloes Compositum.—Compound Decoction of Aloes (extract of Socotrine aloes; myrrh; saffron; carbonate of potassium; extract of liquorice; compound tincture of cardamoms; distilled water). Contains four grains of extract of aloes in a fluid ounce.

Dose.—½ to 2 fluid ounces.

Enema Aloes.—Enema of Aloes (Socotrine aloes; carbonate of potassium; mucilage of starch).

Pilula Aloes et Asafœtidæ.—Pill of Aloes and Asafœtida (Socotrine aloes, in powder, asafœtida, hard soap, and confection of roses; beaten together until mixed).

Dose.—5 to 10 grains.

Pilula Aloes et Myrrhæ.—Pill of Aloes and Myrrh (Socotrine aloes; myrrh; saffron, dried; treacle and glycerine).

Dose.—5 to 10 grains.

Pilula Aloes Socotrinæ.—Pill of Socotrine Aloes (Socotrine aloes and hard soap, in powder, volatile oil of nutmeg and confection of roses, beaten together).

Dose.—5 to 10 grains.

Tinctura Aloes.—Tincture of Aloes (Socotrine aloes, in coarse powder; extract of liquorice; proof spirit).

Dose.—1 to 2 fluid drachms.

Vinum Aloes.—Wine of Aloes (Socotrine aloes : cardamom seeds, bruised ; ginger, in coarse powder ; sherry. Prepared by maceration).

Dose.—1 to 2 fluid drachms.

Socotrine Aloes is also contained in *Pilula Rhei Composita*, and *Tinctura Benzoini Composita.*

Aloin.—Aloin $C_{16}H_{18}O_7$ (fig. 309). A crystalline substance extracted from aloes by solvents, and purified by recrystallisation.

Characters.—Occurs generally in tufts of acicular crystals, yellow, without odour, and having the taste of aloes. Sparingly soluble in cold water, freely soluble in hot water, rapidly altered in alkaline fluids, not readily altered in neutral or acidified solutions.

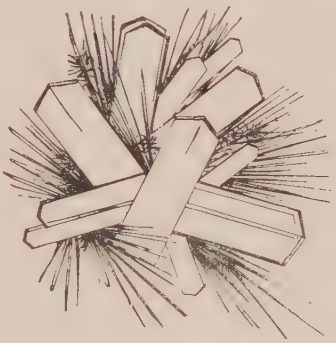


Fig. 309.—Microscopical appearance of crystals of Aloin.

Dose.—½ to 2 grains.

Almost all varieties of Aloes yield the active purgative principle, *Aloin*, which when acted upon by cold nitric acid forms also *Aloetic Acid*, a substance striking olive-brown with persalts of iron. When aloes is acted upon by nitric acid, *Polychromic*, *Chrysammic*, and *Chrysolepic Acids* result.

Therapeutics.—Taken internally, aloes is a purgative, chiefly acting upon the lower part of the intestinal canal. Its action is slow, and the secretions of the tube are but little increased. It is frequently emmenagogue. Small doses appear to exert tonic and stomachic effects upon the upper part of the canal. The preparations of aloes are given in habitual constipation ; they seldom lead to subsequent confinement of the bowels. They may be given in chronic dyspepsia, combined with stomachics and tonics, and they are frequently employed as adjuncts to other purgatives, as scammony, colocynth, and rhubarb when the secretion of bile is deficient and full cathartic

effects are necessary. Aloes, in combination with myrrh and iron, is frequently prescribed in amenorrhœa, associated with anæmia and defective action of the pelvic organs. The drug should be avoided when there is much tendency to hæmorrhoids, or in cases where the abdominal organs are in a state of inflammation.

Apparently but little difference exists between the action of Barbadoes and that of Socotrine aloes. Some physicians, however, are of opinion that the extract of Barbadoes aloes is more efficacious than the same quantity of the Socotrine variety.

Aloes often causes griping, especially when given alone.

Aloin is stated to possess the same purgative properties as aloes, but to occasion less griping.

2.—URGINEA SCILLA.

Scilla.—Squill.—The bulb of Urginea Scilla divested of its dry membranous outer-scales, cut into slices, and dried. From the southern coasts of Europe bordering on the Mediterranean.

Characters.—As seen in Pharmacies the slices are flattish or somewhat four-sided, curved, yellowish white or somewhat pinkish, from about one or two inches long, translucent, inodorous, disagreeable, bitter, brittle, and easily pulverisable if quite dry, but tough and flexible when moist.

Squill apparently contains an *acrid resin* possessing powerful medicinal properties, and a very bitter principle, *Scillitoxin*, together with sugar, mucilage, and citrate of calcium.

Dose.—In powder, 1 to 3 grains.

Official Preparations.—Acetum Scillæ.—Vinegar of Squill (squill, bruised, and diluted acetic acid. Mixed and evaporated to a certain specific gravity).

Dose.—15 to 40 minims. Used in preparing the two following :—

Oxymel Scillæ.—Oxymel of Squill (vinegar of squill and clarified honey).

Dose.—$\frac{1}{2}$ to 1 fluid drachm.

Syrupus Scillæ.—Syrup of Squill (vinegar of squill and refined sugar dissolved with a little heat).

Dose.—½ to 1 fluid drachm.

Pilula Scillæ Composita.—Compound Squill Pill (squill, ginger, ammoniacum, hard soap, all mixed in powder and treacle added; the whole then beaten into a uniform mass).

Tinctura Scillæ.—Tincture of Squill (squill, bruised, and proof spirit. Prepared by maceration and percolation).

Dose.—10 to 30 minims.

Powdered squill is also contained in *Pilula Ipecacuanhæ cum Scillâ.*

Therapeutics.—Squill acts as a stimulating expectorant and diuretic in small doses; in larger doses it may cause vomiting and purging. It increases the secretions of the mucous membrane of the bronchi, and assists the expectoration of mucus when viscid and abundant. It is contra-indicated in cases of an active inflammatory nature in consequence of its acrid and stimulating properties. As an expectorant, squill is often combined with ammoniacum and ipecacuanha, and as a diuretic it is usually administered with digitalis or some mercurial.

Melanthaceæ.

1.—COLCHICUM AUTUMNALE. THE MEADOW SAFFRON.

Colchici Cormus.—The fresh corm of Colchicum Autumnale (fig. 310); collected about the end of June or beginning of July; and the same, stripped of its coats, sliced transversely, and dried at a temperature not exceeding 150° F. (65·5° C.). An indigenous wild herb.

Characters.—The fresh corm is about the size of a chestnut, somewhat conical, flattened on one side, at which is a new corm in process of development, and rounded on the other. Outer coat brown, thin, and membranous; inner coat reddish-yellow. Internally solid and white, and when cut yielding a milky juice of a disagreeable odour and bitter taste. The dried slices are one-eighth to one-tenth of an inch thick,

yellowish at their circumference, moderately indented on one side, convex on the other, so that their outline is somewhat kidney-shaped. Surfaces firm, whitish, and amylaceous; breaks readily with a short fracture; no odour. Taste bitter.

FIG. 310.—Colchicum Autumnale. The Meadow Saffron. *a*, the flowering plant; *b*, stigmas, with a portion of the style; *c*, leaves and fruit.

Dose.—*In powder*, 2 to 8 grains.

Official Preparations.—EXTRACTUM COLCHICI.—Extract of Colchicum (the juice expressed from fresh colchicum corms, deprived of their coats, strained and evaporated to the proper consistence for making pills).

Dose.—½ grain to 2 grains.

EXTRACTUM COLCHICI ACETICUM.—Acetic Extract of Colchicum (fresh colchicum corms, deprived of their coats; acetic acid). Made like the preceding, the fluid being evaporated to the consistency of a soft extract.

Dose.—½ grain to 2 grains.

VINUM COLCHICI.—Wine of Colchicum (colchicum corm, sliced and dried; sherry. Prepared by maceration).

Dose.—10 to 30 minims.

Colchici Semina.—COLCHICUM SEEDS.—The SEEDS of Colchicum Autumnale collected when fully ripe, which is usually about the end of July or the beginning of August, and carefully dried.

Characters.—About the size of white mustard seed, one-tenth of an inch in diameter, subglobular, slightly pointed at the hilum, reddish-brown, somewhat rough, very hard and difficult to powder. Taste bitter and acrid.

Both the seeds and the corm contain lignin, gum, starch,

fatty matter, *Cevadic Acid*, and a crystalline principle, *Colchicine*, with traces of *Veratrine*, which is turned *deep violet* by nitric acid.

Official Preparation.—Tinctura Colchici Seminum.—Tincture of Colchicum Seeds (colchicum seeds, finely comminuted, and proof spirit. Prepared by maceration and percolation).

Dose.—10 to 30 minims.

Therapeutics.—Given in medicinal doses, colchicum increases the action of some of the secreting organs; the fæces become more coloured, and the bile is apparently thrown out in larger quantities. The urine is also sometimes increased in quantity, and the action of the skin increased. The action of the heart is diminished, and in some persons the pulse becomes intermittent. Vomiting and purging, with intense prostration, ensue from the exhibition of large doses.

Colchicum is regarded almost as a specific in acute attacks of gout, and it is extensively employed in all forms of this malady, its administration being followed by great relief to the inflammation and pain. It frequently gives relief in rheumatism and other inflammatory affections, probably from its controlling power over the heart's action, rather than from any specific effect. It may be used with advantage as a cholagogue in combination with other purgatives; and it may be often substituted for mercurials. It has at times been given in skin affections and in dropsy.

2.—SCHŒNOCAULON OFFICINALE.

Sabadilla.—Cevadilla.—The dried ripe seeds of Schœnocaulon Officinale (fig. 311). Imported from Mexico. If imported in the pericarps these should be rejected.

Characters.—About one quarter of an inch or less in length, narrow, fusiform, or somewhat scimitar-shaped, prolonged above into a membranous wing, somewhat compressed, wrinkled, shining, blackish-brown. Taste bitter, acrid; inodorous, but when powdered causing violent sneezing. Contains two acids, *Veratric* and *Cevadic*, and an active principle,

Veratrina.—VERATRINE ($C_{32}H_{52}N_2O_8$).—An ALKALOID, or mixture of alkaloids, obtained from Cevadilla ; not quite pure. May be obtained thus : cevadilla, distilled water, rectified spirit, solution of ammonia, hydrochloric acid, and purified animal charcoal.

FIG. 311.—Schœnocaulon Officinale. The Cevadilla. *a*, fruit-bearing stem ; *b*, root, bulb, and leaves.

Characters and Tests. — Pale-grey, amorphous, without smell, but, even in the most minute quantity, powerfully irritating the nostrils ; strongly and persistently bitter, and highly acrid ; insoluble in water, soluble in spirit, in ether, and in diluted acids, leaving traces of an insoluble brown resinous matter. Heated with access of air, it melts into a yellow liquid, and at length burns away, leaving no residue. An active poison. With nitric acid it forms a yellow solution, and with sulphuric acid forms an *intense red* solution, which, by reflected light, exhibits a green fluorescence.

The Veratrine of commerce contains *Sabadilline*, which is insoluble in ether and does not excite sneezing.

Dose.—$\frac{1}{60}$ grain to $\frac{1}{15}$ grain. Must be used with great care if given internally.

Official Preparation.—UNGUENTUM VERATRINÆ.—Ointment of Veratrine (veratrine, hard and soft paraffins, and olive oil) =(8 grains to the ounce).

Therapeutics.—When brought in contact with the nasal passages, veratrina excites violent sneezing. Placed on the unbroken skin it produces a sensation of heat and pricking. Taken internally it causes diarrhœa, nausea, and vomiting, and formication in the extremities ; the pulse becomes slow, weak, and eventually irregular ; the temperature falls, and muscular weakness, twitching, convulsions, collapse, and death may follow. Veratrina exercises a peculiar action upon the heart ; at first there is a transient quickening, which has been attributed to stimulation of the motor ganglia ; then follows a

retardation, the vagi becoming influenced. The tetanoid spasms which are immediately produced by veratrina upon the voluntary muscles are not arrested by severing the connexion of the muscles with the spinal cord, as is the case with the spasms resulting from strychnina poisoning. Medicinally, veratrina has been given to reduce the temperature and the pulse in acute sthenic febrile affections, as lobar pneumonia and erysipelas: it has also been used in gout and rheumatism Externally the ointment has relieved pain in neuralgia of the fifth nerve, and it may be employed as a substitute for aconite.

3.—VERATRUM VIRIDE. THE GREEN HELLEBORE.

Veratri Viridis Rhizoma.—Green Hellebore Rhizome. The dried rhizome and rootlets of Veratrum Viride (fig. 312). Has been called the Swamp Hellebore and Indian Poke. Collected in autumn in the United States and Canada. Grows in marshy and swampy districts. The Veratrum Album, or White Hellebore, is shown in fig. 313.

Fig. 312.—Veratrum Viride. The Green Hellebore.

Fig. 313.—Veratrum Album. The White Hellebore.

Characters.—Either entire or sliced, with or without rootlets. When entire about two inches long and about three-quarters of an inch in diameter, erect, obconical, obtuse or truncated at the apex; externally dark brown, internally whitish. At the upper end are generally concentrically arranged remains of the leaves. Yellowish-white shrivelled rootlets may be given off from the rhizome, or, if these are detached, corresponding scars are left. It is inodorous, but when powdered causes sneezing. Taste very acrid and bitterish. Said to contain various alkaloids, as *Jervine*, *Pseudojervine*, *Cevadine*, a small quantity of *Rubijervine*, with traces of *Veratrine*, *Veratroidine*, and *Veratralbine*.

Dose, in powder.—1 to 3 grains or more.

Official Preparation.—Tinctura Veratri Viridis.—Tincture of Green Hellebore (green hellebore rhizome, in No. 40 powder, and rectified spirit. Prepared by maceration and percolation).

Dose.—5 to 20 minims.

Therapeutics.—The Hellebore is said to be valuable in controlling the vascular system in inflammatory diseases, and especially in gout, rheumatic fever, and allied affections. After absorption the characteristic symptoms of its action are depression and slowness of the pulse. *Jervine* has been found to produce convulsions by irritating the motor centres of the brain. *Veratroidine* differs from jervine, since it always induces purging and vomiting, and causes less violent convulsions. The Hellebore should be used with great caution, and any symptom of marked depression carefully noted.

Smilaceæ.

SMILAX OFFICINALIS. SARSAPARILLA.

Sarsæ Radix.—Jamaica Sarsaparilla.—The dried root of Smilax Officinalis (figs. 314, 315, and 316). Commonly known as Jamaica Sarsaparilla, from having been formerly obtained from Central America by way of that island.

Characters.—Sarsaparilla consists of the rootstock, to which are attached numerous roots, usually several feet in length; from

these roots are frequently given off secondary rootlets, these being again finely subdivided, when they are said to be bearded. On transverse section, the roots present a rind or cortex, with a ligneous (woody) cord or meditullium which encloses the pith (figs. 317–320).

FIG. 314.—Smilax Officinalis. The Sarsaparilla.

Dr. Pereira classified the sarsaparillas of commerce into non-mealy and mealy varieties, according to the characters of these layers.

The *Non-Mealy* (fig. 323) varieties possess a cortex which is deeply coloured

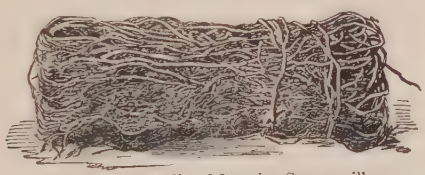


FIG. 315.—Bundle of Jamaica Sarsaparilla.

FIG. 316.—Plait of Jamaica Sarsaparilla (non-mealy).

FIG. 317.

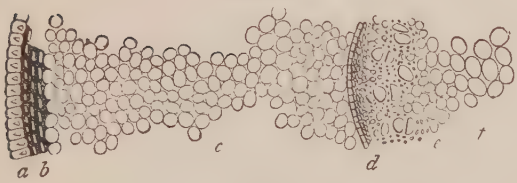
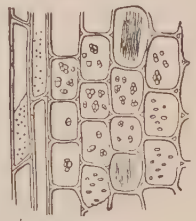


FIG. 318.



Magnified sections of Sarsaparilla.

FIG. 317.—Transverse section of the cortex and half of the diameter of the meditullium.
FIG. 318.—Longitudinal section of the cortex.
a, cuticle or epidermis; *b*, outer cortical layers (subcuticular tissue); *c*, inner cortical layers. Most of the cells abound in starch; some few contain raphides; *d*, cellular layer or nucleus sheath; *e*, woody zone (vascular-bundle circle); *f*, medulla or pith.

and is not mealy. Microscopically but comparatively few granules can be found. In diameter the meditullium is usually

four or five times greater than the cortex. Upon applying sulphuric acid to a transverse section, both the cortex and wood acquire a dark red tint, and but little starch is shown upon adding iodine.

FIG. 319.

FIG. 320.

Magnified view of the cells composing the nucleus sheath (according to Schleiden).

FIG. 319.—Central American Sarsaparilla (Honduras).
FIG. 320.—South American Sarsaparilla (Vera Cruz).
a, *a*, *a*, *a*, the cells of the sheath; *b*, a portion of the woody zones.

In this division are included the *Jamaica*, the *Lima*, and the *true* or *lean Vera Cruz*.

The only official variety is the Jamaica Sarsaparilla (fig. 315).

FIG. 321.—Bundle of Lima Sarsaparilla.

This occurs in bundles from a foot to a foot and a half long, having its roots twisted in a spiral manner, furrowed somewhat, of variable thickness, but the diameter not exceeding that of a goose quill several feet in length, folded, with a number of

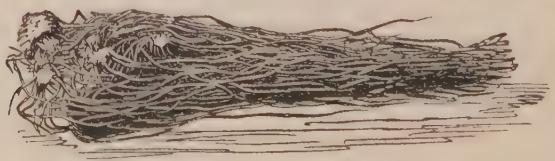


FIG. 322.—Bundle of Vera Cruz Sarsaparilla.

reddish-brown rootlets (*bearded*): the taste is mucilaginous, slightly bitter and acrid. When heated with water, it yields a considerable quantity of extractive matter.

The *Lima Sarsaparilla* (fig. 321) is derived from Smilax Officinalis and occurs in bundles which are of a greyish-brown colour, each bundle being about two or three feet in length.

The true or lean *Vera Cruz Sarsaparilla* (fig. 322) is lean and unfolded, with few rootlets, and is seldom found in commerce.

The *Mealy Varieties* (fig. 324) contain a large quantity of starch in the inner cortical layers, which sometimes are equal in thickness to the meditullium. They break with a starchy fracture. The cortex is frequently cracked transversely and occasionally falls off. They sometimes present a swollen appearance,

FIG. 323.—Magnified view of a section of non-mealy (Jamaica) Sarsaparilla. *a*, cuticle or epidermis; *b*, outer cortical layers; *c*, red inner cortical layers; *d*, cellular sheath; *e*, woody zone; *f*, medulla or pith.

FIG. 324.—Magnified view of a section of mealy (Honduras) Sarsaparilla. *a*, cuticle or epidermis; *b*, outer cortical layers; *c*, mealy coat or inner cortical layers; *d*, cellular sheath; *e*, woody zone; *f*, medulla or pith.

and are then termed *gouty*. Upon adding sulphuric acid to a transverse section, no change is observed in the mealy coat, but the ligneous zone acquires a dark purple colour, and upon applying solution of iodine the blue iodide of starch is distinctly shown.

In this division are included the *Honduras*, the *Brazilian* or *Lisbon*, and the *Caraccas* or *gouty Vera Cruz*. Of the *Honduras Sarsaparilla* the botanical origin is doubtful. It occurs in long bundles (fig. 325) about three feet in length, consisting of the folded roots which are secured by a few circular twists. Colour dirty-brown, and having numerous lateral fibres

The *Brazilian* or *Lisbon Sarsaparilla* (fig. 327) is probably derived from Smilax Papyracea and Smilax Officinalis. It comes from the Brazils through Lisbon.

The *Guatemala Sarsaparilla* (fig. 328) is also derived from Smilax Papyracea. It occurs in bundles, from three to five feet in length, and consists of unfolded roots with a few rootlets,

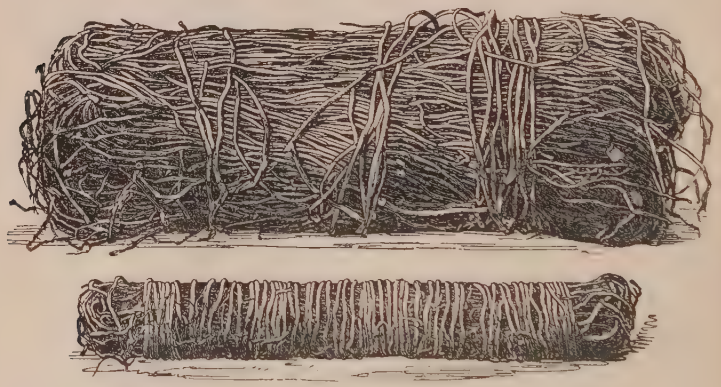


FIG. 325.—Large and small bundles of Honduras Sarsaparilla.

FIG. 326.—Bundle of Caraccas Sarsaparilla.

which are bound very tightly together by a flexible stem. Its colour is reddish-brown.

The *Caraccas* or *gouty Vera Cruz Sarsaparilla* (fig. 326) is derived from Smilax Officinalis and Smilax Syphilitica.

It is met with in bundles, two feet and a half in length, and one foot in breadth, and of a pale yellow colour.

Sarsaparilla contains a volatile oil, woody fibre, and starch, together with a bitter crystallisable principle, *Sarsaparillin*, *Smilacin*, or *Parillinic Acid*, a white powder turning red with sulphuric acid.

Official Preparations.—Decoctum Sarsæ.—Decoction of Sarsaparilla (Jamaica sarsaparilla cut transversely, and boiling distilled water).

Dose.—2 to 10 fluid ounces.

Decoctum Sarsæ Compositum.—Compound Decoction of Sarsaparilla (Jamaica sarsaparilla cut transversely, sassafras root in chips, guaiacum-wood turnings, dried liquorice-root bruised, mezereon bark, and boiling distilled water).

Dose.—2 to 10 fluid ounces.

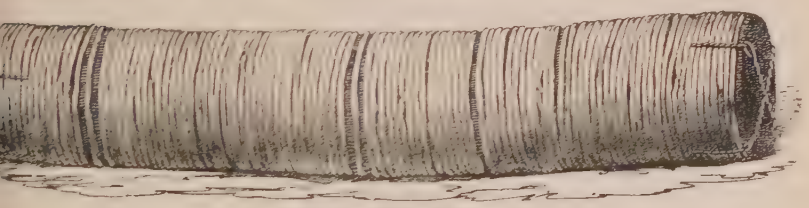


Fig. 327.—Brazilian Sarsaparilla.

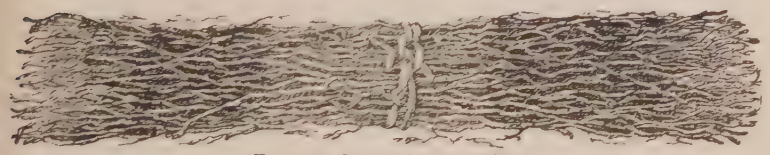


Fig. 328.—Guatemala Sarsaparilla.

Extractum Sarsæ Liquidum.—Liquid Extract of Sarsaparilla (Jamaica sarsaparilla, in No. 40 powder, proof spirit, sugar, and distilled water, at 160° F. Prepared by maceration, straining, and evaporation).

Dose.—2 to 4 fluid drachms.

Therapeutics.—Sarsaparilla is supposed to be diaphoretic, diuretic, tonic, and alterative. It is much used in the treatment of constitutional syphilis; but as it is generally given in combination with powerful remedies, it is a question how much influence the drug itself really exercises.

Adulterations.—Inferior kinds of sarsaparilla, which yield much less extractive matter; sometimes it is mixed with other substances, as Dulcamara; these are detected by their different structure.

Zingiberaceæ.

1.—ELETTARIA CARDAMOMUM. THE MALABAR CARDAMOM.

Cardamomi Semina.—CARDAMOMS.—The dried ripe SEEDS of the Malabar Cardamom (fig. 329). Native of Malabar. The seeds are best kept in their pericarps, in which they are imported; from these they should be separated when required for use, the pericarps being rejected.

FIG. 329.—Malabar Cardamoms. *a*, shorts; *b*, short-longs; *c*, long-longs.

Characters.—About one-sixth of an inch in length, irregularly angular, wrinkled transversely, externally dark reddish-brown, internally whitish. Taste and odour agreeably warm and aromatic. The pericarps in which they are enclosed vary from about two-fifths of an inch to nearly one inch in length, and from about one-fifth to two-fifths of an inch in breadth. They are oblong or ovoid, obtusely triangular, shortly beaked and rounded at the base, striated longitudinally. Destitute of taste and odour. These seeds yield a volatile oil, having an aromatic taste and fragrant odour, and consisting of a liquid portion and a crystalline camphor, isomeric with turpentine camphor ($C_{10}H_{16},3H_2O$). They also contain a fixed oil and an acrid resin with colouring matter and salts.

The seeds only should be used. Cardamoms are distinguished as "shorts," "short-longs," and "long-longs," according to their respective lengths (fig. 329). The shorts are the most esteemed.

Dose, in powder.—5 to 20 grains.

Official Preparation.—TINCTURA CARDAMOMI COMPOSITA.—Compound Tincture of Cardamoms (cardamom seeds, bruised; caraway fruit, bruised; raisins, freed from seeds; cin-

namon bark, bruised ; cochineal, in powder, and proof spirit. Prepared by maceration and percolation).

Dose.—½ to 2 fluid drachms.

This tincture is contained in *Decoctum Aloes Compositum*, *Mistura Ferri Aromatica*, *Mistura Sennæ Composita*, and *Tinctura Chloroformi Composita.*

Cardamoms are also contained in *Extractum Colocynthidis Compositum*, *Pulvis Cinnamomi Compositus*, *Pulvis Cretæ Aromaticus*, *Tinctura Gentianæ Composita*, *Tinctura Rhei*, and *Vinum Aloes.*

Therapeutics.—Cardamom is an agreeable aromatic stimulant, stomachic and carminative ; used as a condiment in the East. It is mostly given as an adjunct to purgatives and other medicines, to prevent griping.

The fruit of the Amomum Cardamom, or Round Cardamom, is shown in fig. 330.

It varies in size from a black currant to a cherry, and its effects are similar to the Malabar Cardamom.

The Amomum Granum Paradisi (fig. 331) was at one time supposed to yield the "Grains of Paradise." The Amomum Melegueta (figs. 332, 333) is now ascertained to be the only source of these grains.

FIG. 330.—Amomum Cardamomum. The Round Cardamom. Varies in size from a black currant to a cherry.

FIG. 331.—Amomum Granum Paradisi (natural size).

The term *Melegueta Pepper* (figs. 334, 335) has been given to the fruit or seeds of several zingiberaceous plants as well as to

FIG. 332.—Amomum Melegueta. Leaves and flower.

a, stem and leaves; *b*, entire flower and floral bracts; *c*, exterior limb of corolla; *d*, interior limb of corolla or lip; *e*, filament, anther, stigma, style, and ovary; *f*, style and barren anthers (germinal processes).

FIG. 333.—Entire fruit of Amomum Melegueta (dried).

FIG. 334.—Capsule of Melegueta Pepper Fruit.

FIG. 335.—Melegueta Pepper Fruit.

FIG. 336.—Amomum Maximum. The Great Winged or Java Cardamom. *a*, the dried fruit of commerce; *b*, the fruit which has been soaked in water to expand the wings; *c*, seeds.

the pimento or allspice. It is generally regarded as synonymous with the terms "Grains of Paradise" and "Guinea grains." The seeds are roundish or ovate, somewhat cuneiform and bluntly angular, shining golden brown, and wrinkled; internally white.

The Amomum Maximum, great winged or Java Cardamom, is shown in fig. 336; and the Amomum Korarima, or Korarima Cardamom, in fig. 337.

The Amomum Citratum, or Cardamomum Majus, is shown in fig. 338. The seeds are oblong, angular, larger than those of the Malabar Cardamom, shining brownish-yellow, and have a large concave depression (hilum) at one extremity.

FIG. 337.—Amomum Korarima. Korarima Cardamom. Cardamomum Maximum Matthioli. *a*, the "Korarima" of Dr. Beke; *d*, seeds of Korarima.

Fig. 339 shows the Amomum Clusii; fig. 341 the Amomum Danielli, or Bastard Melligetta; and fig. 340 the Amomum Macrospermum, or large-seeded Guinea Amomum. The fruits and seeds of Amomum Globosum, the large round China Cardamom, are shown in figs. 342, 343, and the small round China Cardamom in fig. 344.

The fruits and seeds of the Bitter-seeded Cardamom and the fruit of Amomum Xanthioides are seen in figs. 345, 346. These seeds much resemble those of the Malabar Cardamom,

FIG. 338.—Cardamomum Majus or Amomum Citratum. *a*, fruits tied together in a bunch; *b*, seeds.

FIG. 339.—Amomum Clusii.

FIG. 340.—Amomum Macrospermum. The Large-seeded Guinea Amomum, Banda Cardamom (of Martius), with seeds.

FIG. 341.—Amomum Danielli. Fruits and Seeds.

FIG. 342.—Amomum Globosum. Large Round China Cardamom. Fruits and Seeds.

FIG. 343.—Large Round China Cardamoms deprived of the husk.

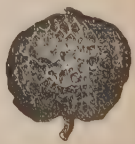


FIG. 344.—Amomum Globosum. Small Round China Cardamom.

FIG. 345.—Bitter-seeded Cardamom. Fruit and Seeds.

FIG. 347.—Alpinia Alba. Ovoid China Cardamom.

FIG. 346. -Fruit of Amomum Xanthioides.

FIG. 348.—Elettaria Maior. The Ceylon Cardamom.

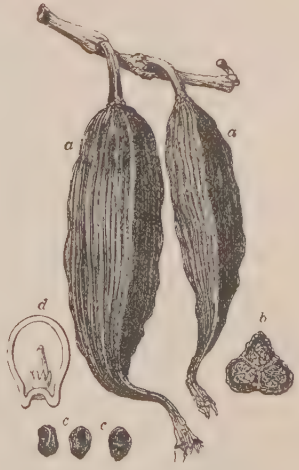


FIG. 349.—Elettaria Major. The Ceylon Cardamoms. *a*, *a*, the dried capsules of commerce; *b*, transverse section of a capsule; *c*, *c*, seeds; *d*, magnified view of a section of a seed to show the embryo seated in the vitellus.

but are not so rugose, and they are distinguishable by their peculiar aromatic smell and taste.

The *Alpinia Alba*, or *Ovoid China Cardamom*, is shown in fig. 347. The seed is about the size and shape of a large nutmeg.

The *Elettaria Major*, the greater or Ceylon Cardamom, is shown in figs. 348, 349.

2.—CURCUMA LONGA. TURMERIC.

Curcuma.—TURMERIC.—The dried RHIZOME of Curcuma Longa (figs. 350, 351, and 352).

Varieties.—Five varieties of Turmeric are known in the English market, viz. China, Bengal, Madras or Bombay, and Java and Batavia Turmeric. If sorted according to their resemblance, the China and Java varieties would be placed in one

FIG. 350.—Curcuma.

FIG. 351.—Curcuma Rotunda. China Round Turmeric.

FIG. 352.—Curcuma Longa. China Long Turmeric.

group, the Madras and Malabar in a second group, and the Bengal in a third.

The *China Turmeric* consists of smooth, plump, round, long tubers (*Curcuma Rotunda* and *Longa*, figs. 351, 352); exter-

nally of a greenish-yellow hue. They yield a bright powder, and thus are preferred for medicinal purposes.

Bengal Turmeric consists of thin or narrow long tubers (fig. 353); externally moderately smooth, and of a dull greenish-yellow colour. Breaks with a deep reddish fracture. It is a strong dye.

Madras Turmeric is the most showy kind. It consists chiefly of large long tubers (figs. 356, 357), but mixed with transverse segments of round tubers, marked externally by longitudinal wrinkles, the surface of which is rubbed and

FIG. 353.—Curcuma Longa. Bengal Turmeric.

FIG. 354.—Curcuma Longa. Malabar Turmeric.

FIG. 355.—Curcuma Rotunda and Longa. Java Turmeric.

bright yellow. The colour internally is that of a fresh fractured surface of gamboge.

Malabar Turmeric (fig. 354) consists chiefly of long tubers (Curcuma Longa, fig. 352); the round tubers (Curcuma Rotunda, fig. 351) being few, and of very inferior quality.

Java Turmeric (fig. 355) consists of both round and long tubers (Curcuma Rotunda and Longa, figs. 351, 352), but chiefly the latter. They have a greenish-yellow hue.

A bulb of *Batavian Turmeric*, said to come from Java, is

shown in fig. 358. It contains much colouring matter, and is probably the produce of Curcuma Viridiflora.

Turmeric contains a yellow colouring principle, *Curcumin*, which is turned deep reddish-brown by alkalies, but unaltered in tint by any acids except boric acid.

Official Preparations.—Turmeric Tincture.—(Turmeric bruised, macerated with rectified spirit, and filtered).

Turmeric Paper.—Unsized white paper steeped in tincture of turmeric, and dried by exposure to the air.

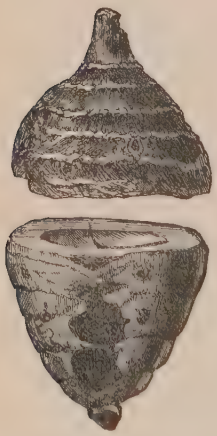


Fig. 356. Madras Long Turmeric.

Fig. 357.—Madras Round Turmeric.

Fig. 358.—Curcuma Viridiflora. Batavian Turmeric.

Uses.—Not used as a remedy; is taken as a condiment in the form of curry powder, of which it is an ingredient. It is introduced into the British Pharmacopœia as a test for alkaline solutions, in contact with which its colour is changed to reddish-brown. Also employed as a test for boric acid, an aqueous solution of which, slightly acidified with hydrochloric acid, becomes brownish-red on gently drying, the colour becoming green on the addition of solution of potash.

3.—ZINGIBER OFFICINALE. THE GINGER.

Zingiber.—GINGER.—The scraped and dried RHIZOME of Zingiber Officinale (fig. 359). From plants cultivated in the West and East Indies; native of Hindostan.

Characters.—Flattish, irregularly branched pieces, usually from about three to four inches in length, each branch marked at the summit by a depressed scar. Externally pale buff-coloured, somewhat fibrous and striated. Breaks readily with a mealy, short, rather fibrous fracture. Odour agreeable, aromatic. Taste strong and pungent. Powder yellowish-white. Contains a *volatile oil*, upon which its pungency depends, resinous matters, and a large quantity of starch.

FIG. 359.—Zingiber Officinale. The Ginger.

Dose, in powder.—10 to 20 grains and upwards.

Official Preparations.—SYRUPUS ZINGIBERIS.—Syrup of Ginger (strong tincture of ginger, and syrup, mixed with agitation).

Dose.—1 fluid drachm.

TINCTURA ZINGIBERIS.—Tincture of Ginger (ginger, in powder, and rectified spirit; 2½ ounces to the pint. Prepared by maceration and percolation).

Dose.—15 minims to 1 fluid drachm.

TINCTURA ZINGIBERIS FORTIOR.—Strong Tincture of Ginger (ginger, in fine powder, and rectified spirit; 10 ounces to the pint. Percolated with half the spirit and then more added until a pint has been collected).

Dose.—5 to 20 minims.

This tincture is contained in *Acidum Sulphuricum Aromaticum*, *Pilula Scammonii Composita*, and in the *Syrupus Zingiberis*.

Ginger forms an ingredient of many other official preparations.

Therapeutics.—This substance is an aromatic stimulant and carminative. Taken internally, it produces an agreeable feeling of warmth at the epigastrium and appears to assist digestion by

imparting a healthy tone to the stomach. It is employed in dyspepsia, especially when attended by much flatulence, and as an adjunct to purgatives to obviate their griping tendency. It acts as a sialogogue when chewed, and is sometimes employed in relaxation of the tonsils and uvula.

CLASS III. ACOTYLEDONES.

Lichenes.

1.—CETRARIA ISLANDICA.

Cetraria.—Iceland Moss.—The dried lichen Cetraria Islandica (fig. 360). Native of the North of Europe, and obtained in large quantities in Iceland.

Fig. 360.—Cetraria Islandica. Iceland Moss.

Figs. 361, 362, and 363 represent the microscopic appearances of sections of the lichen.

Characters.—Consists of a foliaceous thallus, the lobes subdivided irregularly, fringed at the edges, cartilaginous, crisp brownish-white, paler beneath, and irregularly marked with white depressed small spots; when dry nearly without odour, but having a feeble odour of seaweed when moistened by water. Taste mucilaginous and bitter. A strong decoction gelatinises on cooling; the gelatinous matter is termed *Lichenin.*

This moss also contains a bitter crystallisable principle, called *Cetraric Acid*, or *Cetrarin.*

Official Preparations.—Decoctum Cetrariæ.—Decoction of Iceland Moss (Iceland moss, boiled with distilled water, and strained).

Dose.—1 to 4 fluid ounces.

Therapeutics.—Used by the Laplanders and Icelanders as an article of food when deprived of its bitter principle. The decoction is demulcent and slightly tonic.

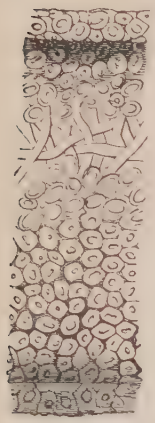


FIG. 361.—Transverse section of the thallus.

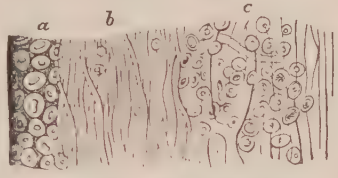


FIG. 362.—Longitudinal section of the thallus.

FIG. 363.—Longitudinal sections of the apothecium with the thecæ and the adherent filamentous layer.

Sections of Cetraria Islandica.

a, external or cortical layer, which *does not become blue* by the addition of tincture of iodine; *b*, subcortical layer which *becomes blue* on the addition of tincture of iodine; *c*, medullary layer, composed of felted filaments, or tubes, and intermixed nucleated cells.

2.—ROCCELLA TINCTORIA AND VARIOUS SPECIES, &c.

Lacmus.—LITMUS.—A BLUE PIGMENT prepared from various species of Roccella, viz. Tinctoria or Dichotoma, Fuciformis, Montagnei, Phycopsis (figs. 364–368); occurs in small cakes, made up of a granular powder. The lichen is macerated for some time in water with ammonia, first becoming red and then blue; it is then removed, and reduced to a proper consistence, and made up with chalk or plaster of Paris into small cakes. Has an odour of violets.

FIG. 364.—Roccella Tinctoria.

In the manufacture of Litmus it appears that the lichen is macerated for several weeks in a mixture of urine, lime, and potash. A kind of fermentation takes place, the lichen becoming first reddish and

subsequently blue. When the pulp has acquired the proper blue colour, it is placed in suitable moulds, and the cakes thus obtained are subsequently dried. The moulds (fig. 369) are of

FIG. 365. FIG. 366. FIG. 367. FIG. 368.

Roccella and Orchella Weed.

FIG. 365.—Roccella Tinctoria. *a*, thallus with apothecia; *b*, thallus with soredia; *c*, portion of thallus with three more developed apothecia; *d*, Roccella Tinctoria or Dichotoma.
FIG. 366.—Roccella Fuciformis.
FIG. 367.—Roccella Montagnei. *a*, thallus with soredia; *b*, the same magnified.
FIG. 368.—Roccella Phycopsis with soredia.

brass or steel, and consist of two parts: the lower one, divided into rectangular cells, and the upper one, supporting a series of metallic rods bearing small metallic discs, arranged so as to

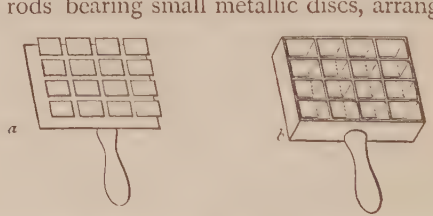


FIG. 369.—Mould used in making Litmus. *a*, the lower or cell-piece; *b*, the upper piece.

fit accurately the cells of the lower piece. The lower piece is immersed in the pulp with which they are filled, the excess of pulp being scraped off with a wooden spatula. Upon the application of the upper piece the discs enter the cells and force out the moulded cakes of Litmus.

The chief constituent of the blue colouring matter is *Orcein*.

Blue Litmus Paper.—Unsized white paper steeped in solution of litmus and dried by exposure to the air. Used as a test for acids, or any acid liquid, by which the blue colour is changed to red.

Red Litmus Paper.—Unsized white paper steeped in solution of litmus which has been previously reddened by the addition of a very minute quantity of sulphuric acid and dried by exposure to the air.

The Red Litmus Paper is used to indicate the presence of any substance having an alkaline reaction, by which the paper is restored to its original blue colour.

Filices.

ASPIDIUM FILIX-MAS. THE MALE FERN.

Filix-mas.—Male Fern.—The rhizome, with the persistent bases of the petioles, of the Male Shield Fern, Aspidium Filix-mas (figs. 370–372). Indigenous; should be collected late in the autumn, divested of roots and scales and dead portions, and then carefully dried. If more than a year old it should not be used.

Fig. 370.—Aspidium Filix-mas. The Male Fern.

Characters.—About an inch in diameter, having a dense covering of the hard angular bases of the petioles. Externally brown, internally yellowish, and having a disagreeable though slight odour, and a taste which is first sweet and then nauseous and bitter. The general structure is shown in fig. 372.

The Ferns are usually herbaceous plants with a perennial rhizome, but more rarely they possess an erect arborescent trunk, when they are called tree ferns or *Filices Arboreæ*, of which the Cyathea Glauca (fig. 373) is an illustration.

Male Fern contains tannin, starch, gum and salts, a resin, a volatile oil, and a fixed green oil.

Ether dissolves the active principle, and the ethereal extract deposits a crystalline colourless substance, *Filicic Acid.*

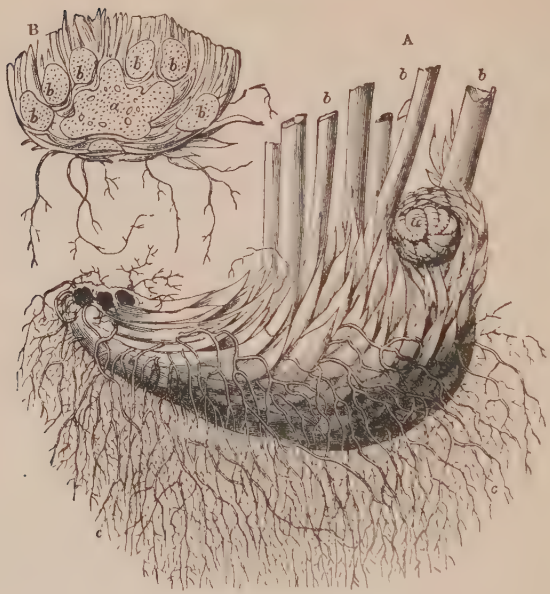


FIG. 371.—Aspidium Filix-mas.

A, fresh rhizome entire—*a*, spirally coiled young frond; *b*, *b*, *b*, leaf-stalks (*stipites*) cut off; *c*, *c*, root fibres. B, transverse section of the fresh rhizome—*a*, transverse section of the stem, with the vascular bundles; *b*, *b*, *b*, *b*, *b*, *b*, bases of the foot-stalk, called *phyllopodia*. They surround the stem in a circular manner, and are devoid of vascular bundles

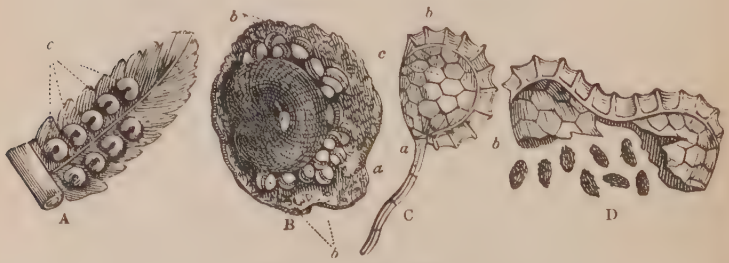


FIG. 372.—Aspidium Filix-mas.

A, pinnule with nine sori (*a*). B, magnified portion of pinnule with the sporangia—*a*, stomata; *b*, *b*, sporangia partially covered by (*c*) the indusium. C, magnified sporangium—*a*, stalk; *b*, ring; *c*, membranous sac. D, ruptured sporangium, with the spores escaping.

The green liquid portion contains *Glyceride of Filoxolyn*, yielding, by saponification, *Filosmylic* and *Filoxylic Acids*.

Dose, in powder.—60 to 180 grains.

Official Preparation.—EXTRACTUM FILICIS LIQUIDUM.—Liquid Extract of Male Fern (male fern, in coarse powder, and sufficient ether to exhaust the rhizome. It is prepared by percolation, the ether being either evaporated or distilled).

FIG. 373.—Cyathea Glauca. A tree fern.

Dose.—15 to 30 minims.

Therapeutics.—Male fern is employed as an antnelmintic, especially in the treatment of the tape-worm, which it apparently kills, and thus assists its expulsion. It should be given during fasting, and followed after an interval by some mild purgative as castor oil. The liquid extract is considered one of the most valuable anthelmintics for removing tape-worm.

ANIMAL KINGDOM.

Class. MAMMALIA.

Cetacea.

PHYSETER MACROCEPHALUS. THE SPERM WHALE.

Cetaceum. — Spermaceti. — A concrete fatty substance, mixed with oil, from the head of Physeter Macrocephalus (fig. 374), inhabiting the Pacific and Indian Oceans. It is separated from the oil by filtration and pressure, and afterwards purified.

Fig. 375 shows the relative size of the Narwhal, the Spermaceti, and the Whalebone Whales.

Characters and Tests.—Crystalline, pearly-white, glistening, translucent, with little taste or odour, reducible to powder by

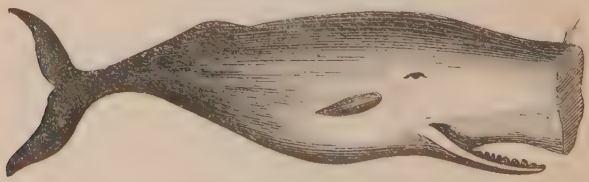


Fig. 374.—Physeter Macrocephalus. The Sperm Whale.

the addition of a little rectified spirit. Insoluble in water, scarcely unctuous to the touch.

Spermaceti or cetine may be regarded as *Palmitate of Cetyl* ($C_{16}H_{33},C_{16}H_{31}O_2$), which by the action of an alkali is split up into *Palmitic Acid* and *Hydrate of Cetyl*, or *Cetylic Acid* ($C_{16}H_{33}HO$), a substance somewhat analogous to glycerine.

Official Preparation.—Unguentum Cetacei.—Ointment of Spermaceti (spermaceti, white wax, almond oil, and benzoin

in coarse powder. Heated and stirred frequently, the residual benzoin being finally strained off).

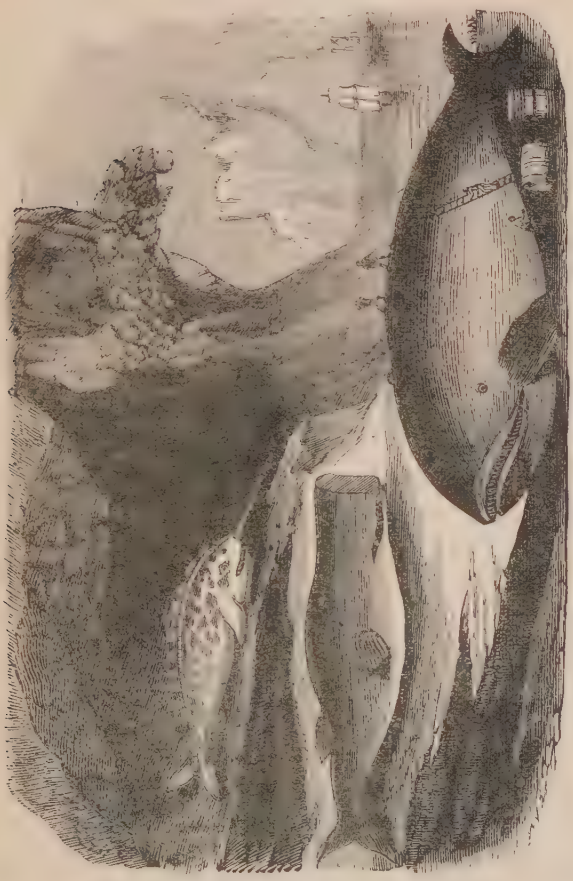


FIG. 375.—Narwhal; Spermaceti Whale; Whalebone Whale.

Spermaceti is also used in the preparation of *Charta Epispastica.*

Therapeutics.—Chiefly used as an emollient application.

Pachydermata.

SUS SCROFA. THE HOG.

Adeps Præparatus.—Prepared Lard.—The purified fat of the hog, Sus Scrofa (figs. 376, 380) (from the internal fat of the abdomen of the hog, perfectly fresh).

As much of the membranes as possible is removed, and the fat is so suspended that it may be exposed freely to the air for some hours; this fat is then cut into small pieces and beaten in a mortar until it is reduced to a uniform mass, in which the membranous vesicles are completely broken.

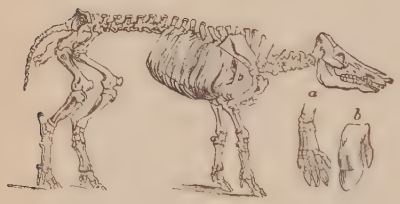


Fig. 376.—Skeleton of Sus Scrofa.
a, foot with five hoofs; *b*, undivided hoof.

The mass thus produced is placed in a vessel surrounded by warm water, and heat is applied until the fat has melted and separated from the membranous matter. The melted fat is finally strained through flannel.

Characters and Tests.—A soft, white, fatty substance, melting at about 100° Fahr. (37·8°C.). Has no rancid odour; dissolves entirely in ether. Consists of a mixture of some *Stearin* and *Palmitin* with a large amount of *Olein*.

Official Preparations.—Unguentum Simplex.—Simple Ointment (white wax, benzoated lard, and almond oil. Used for preparing several other Unguenta).

Prepared Lard is used in preparing *Adeps Benzoatus*, *Emplastrum Cantharidis*, and the *Unguenta: Iodi*, *Terebinthinæ*, and *Hydrargyri Nitratis*.

Adeps Benzoatus.—Benzoated Lard.—Prepared Lard is melted and Benzoin, reduced to coarse powder, is added, the whole being then strained to remove the residual benzoin. The benzoin prevents the lard from becoming rancid, in which

case it would irritate the skin. Benzoated Lard is contained in no less than fifteen Unguenta.

Therapeutics.—Lard is emollient; it is sometimes added to poultices to prevent them becoming hard and dry.

Ruminantia

1.—BOS TAURUS. THE OX.

Fel Bovinum Purificatum.—Purified Ox Bile.—The purified gall of the Ox, Bos Taurus (fig. 377) (fresh ox bile and rectified spirit. The bile and spirit are mixed by agitation in a bottle, and set aside until the sediment subsides. The clear solution is decanted, and the residue evaporated in a porcelain dish by the heat of a water bath until it acquires a suitable consistence for forming pills. The spirit separates the mucus,

Fig. 377. Bos Taurus.

which is always present in bile, and thus the preparation is less liable to putrefaction).

Characters and Tests.—A yellowish-green substance, having a taste partly sweet and partly bitter; soluble in water and in spirit. A solution of one or two grains of it in about a fluid drachm of water, when treated first with a drop of freshly made syrup consisting of one part of sugar and four of water, and then with sulphuric acid cautiously added until the precipitate at first formed is redissolved, gradually acquires a cherry-red colour, which changes in succession to carmine, purple, and violet.

This change of colour is produced by the liberation of cholic acid.

Bile (separated from mucus) consists of two portions, the *colouring* and *fatty* matters, and the *true biliary substance.*

The latter is a species of soap, is pale yellow, and composed of two salts, *Taurocholate* of *Sodium* and *Glycocholate* of *Sodium.*

Taurocholic acid ($C_{26}H_{45}NSO_7$) is the less abundant, and has not yet been obtained in a crystallised state, but *glycocholic* acid ($C_{26}H_{43}NO_6$) can be crystallised in white acicular needles. By the action of alkalies these acids are converted into *cholic acid* ($C_{24}H_{40}O_5$) and into *taurin* ($C_2H_7NSO_3$) and *glycin* ($C_2H_5NO_2$) respectively. The peculiar fat of bile is *cholesterin*, and the green colouring matter is derived from the hæmatin of the red blood-corpuscles.

Dose. 5 to 10 grains or more, given in small gelatine capsules or formed into pills. The former method is to be preferred when it is desired to affect the intestines rather than the stomach.

Therapeutics.—Dried bile in ordinary medicinal doses appears to act as a slight laxative upon the alimentary canal. It is supposed to be a cholagogue, and is given in dyspepsia, especially when vomiting occurs after food.

Lac. Milk.—The fresh milk of the Cow (fig. 377), Bos Taurus. Consists of caseine, fat or butter, milk-sugar, various salts (chiefly phosphates and chlorides), and water. About 12 per cent. of solid matter, and at least 10 per cent. of cream, should be afforded by good milk.

Casein is the nitrogenous constituent, and from this substance milk derives its chief nutritive property. This substance is coagulated by acetic acid, forming "Curds"; a similar effect is produced by other acids and by rennet. "Whey" is the residue of milk from which the cream has been removed by standing, and the caseine by coagulation.

Milk is used in the preparation of *Mistura Scammonii.*

Lactis Saccharum.—Sugar of Milk, $C_{12}H_{24}O_{12}$.—A crystallised sugar (Lactose) obtained from the whey of milk by evaporation.

Characters.—Usually in cylindrical masses, two inches in diameter, with a cord or stick in the axis, or in fragments of cakes; greyish-white, crystalline on the surface, and in its texture, translucent, hard, scentless, faintly sweet, gritty when

chewed. Soluble in about 7 parts of water at common temperatures and in about 1 part of boiling water.

Used in making *Pulvis Elaterini Compositus.*

Dose.—Ad libitum.

Therapeutics.—Sugar of Milk may be used for rubbing up powerful medicinal powders, as calomel, bismuth salts, hydrochlorate of morphine, etc. Added to cow's milk, diluted with water, it may be used as a substitute for the milk of the human female. It is less irritating to the mucous membranes than cane-sugar, and therefore might be advantageously substituted for that sugar in the diet of infants.

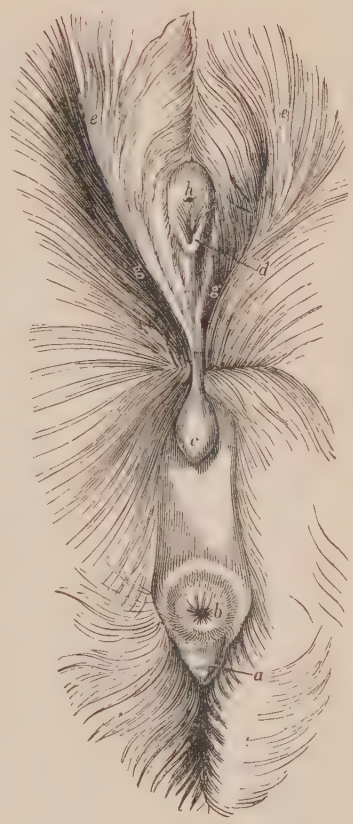


FIG. 378.—Belly of Moschus Moschiferus (from Pallas).

a, tail; *b*, anus; *c*, scrotum; *d*, preputial orifice; *e*, abdomen; *h*, orifice of the musk sac.

2.—MOSCHUS MOSCHIFERUS. THE MUSK DEER.

Moschus. — MUSK. — The dried SECRETION from the PREPUTIAL FOLLICLES of Moschus Moschiferus, the Musk Deer (figs. 378, 379); native of Thibet and other parts of Central Asia. Imported from China and India.

Characters. — In irregular, somewhat unctuous grains of a dark reddish-black or reddish-brown colour, having a strong, peculiar, diffusible, penetrating odour, and a bitterish

taste ; contained in a roundish or oval sac, about two inches in diameter, which is nearly smooth on one side, and covered on the other or outer side with brownish-yellow or greyish adpressed bristle-like hairs, arranged in a concentric manner around a nearly central orifice. The colour of the hairs of the Chinese variety is darker than in the Russian, and the sacs are also smaller than in the latter.

FIG. 379.—Moschus Moschiferus. The Musk Deer.

In each sac from 100 to 200 grains of musk are contained.

Musk contains ammonia, stearin, olein, cholesterin, a little animal matter, various salts, and a volatile oil.

Dose.—5 to 10 grains.

Therapeutics.—Stimulant and antispasmodic, and has been used in epilepsy and hysteria and in typhoid pneumonia.

Adulteration.—The drug is very expensive. The sac in which the musk is contained is frequently emptied and filled with a mixture of dried blood, with more or less of true musk, and the sac carefully closed again. Sacs are sometimes made from the skin or scrotum of the animal, and filled with a mixture of sand, musk, and dried blood.

Microscopically the hairs of the true sac show distinct, regular colour-cells which are not to be found in the hairs of spurious pods.

3.—PEPSIN.

Pepsin.—PEPSINE. – A preparation of the mucous lining of the fresh and healthy stomach of the Pig (fig. 380), Sheep (figs. 381, 382), or Calf.

It is prepared by cutting open the stomach of a recently killed animal, and carefully removing any adherent portions of food. The exposed mucous surface is then slightly and rapidly washed with cold water. The mucous membrane is now scraped with a blunt knife, and the viscid pulp thus obtained is spread out upon a surface of glass or glazed earthenware, and dried quickly at a temperature not exceeding 100°

Fahr. (37·8° C.). The dried residue is powdered and preserved in a stoppered bottle.

Characters and Tests.—A light yellowish-brown powder, having a faint, but not disagreeable, odour, and a slightly saline taste, without any indication of putrescence; very little

Fig. 380.—Sus Scrofa. The Pig.

Fig. 381.—Ovis Aries.

soluble in water or spirit. Two grains of it with an ounce of distilled water, to which five minims of hydrochloric acid have been added, form a mixture in which at least 100 grains of hard-boiled white of egg, passed through wire gauze of 36 meshes per linear inch and made of No. 32 brass or copper wire, will dissolve on their being digested and stirred together for about thirty minutes at a temperature of 130° Fahr. (54·4° C.).

Dose.—2 to 5 grains.

Therapeutics.—Pepsin has been used extensively in the treatment of dyspepsia. It has proved more efficacious when

Fig. 382.—Ovis Aries. Black-faced Ram.

combined with diluted hydrochloric acid, since in the presence of peptones its action is reduced, and can be renewed by adding more diluted acid. Combined with some preparation of iron, pepsin may expedite recovery in cases of extreme anæmia, where the functions of the stomach have become much

deranged. Pepsin, with diluted acid, has been successfully employed in the treatment of spasmodic asthma, in cases where all other remedies have been unsuccessful.

This remedy appears to be especially serviceable in very old persons who suffer from vomiting or regurgitations after each meal, and in whom the distressing symptoms appear to arise from simple debility of the stomach.

A few grains of pepsin mixed with the food have in some cases immediately and entirely removed the dyspeptic symptoms.

4.—OVIS ARIES. THE SHEEP.

Modern zoologists ascribe the native condition of our domesticated sheep, Ovis Aries (figs. 381, 382), to Ovis Ammon

FIG 383.—Ovis Ammon. The Argali.

FIG. 384.—Ovis Musimon. The Mouflon.

(fig. 383), called the *Argali*, of Siberia; or to Ovis Musimon (fig. 384), termed the *Mouflon* or *Muflon*, of Sardinia.

Adeps Lanæ.—WOOL-FAT.—This is the purified cholesterin-fat of sheep's wool.

Characters and Tests.—A yellowish, tenacious, unctuous substance; almost inodorous; with a melting-point varying from 100° Fahr. (37·8° C.) to 112° Fahr. (44·4° C.); readily soluble in ether and in chloroform, sparingly soluble in rectified spirit.

The solution in chloroform poured gently over the surface of sulphuric acid acquires a purple-red colour.

Wool-fat is used in preparing

Adeps Lanæ Hydrosus.—Hydrous Wool-fat.—Commonly known as *Lanoline.*

Wool-fat is melted in a warm mortar, distilled water being stirred in gradually and thoroughly.

Characters and Tests.—Yellowish white ; free from rancid odour. When heated it separates into an upper oily and lower aqueous layer.

Hydrous wool-fat is used in preparing the

Unguentum Conii.—Ointment of Hemlock.—Juice of hemlock is evaporated ; boric acid in fine powder and hydrous wool fat are added, and the whole is mixed thoroughly.

Uses.—Lanoline has an affinity for, and is readily absorbed by, the skin. It causes no irritation ; assists the absorption of narcotic extracts, quinine, iodine, and potassium iodide. Washing the skin with ether renders its absorption more easy, and iodine will appear in the urine in three minutes after friction with this substance. It is more readily absorbed in children than in adults, and may be usefully combined with chrysarobin in the treatment of ringworm and psoriasis, and with salicylic acid in eczema. A mercurial taste has been observed in the mouth in a few minutes after inunctions of lanoline containing 1 part of perchloride of mercury in 1,000 parts. When mixed with the perchloride it is quite as efficacious as an aqueous solution of the mercurial. It should not be mixed with other animal fats. The rapidity of its absorption is due to the similarity between it and the natural fat of the human epithelium. Wool-fat is unfavourable to the percolation and development of micro-organisms, and although favouring the local action of incorporated substances, it retards their absorption.

Sevum Præparatum.—Prepared Suet.—The internal fat of the abdomen of the sheep, Ovis Aries (figs. 381, 382), purified by melting and straining.

Characters.—Prepared suet is white, smooth, almost scentless ; fusible at 103° F. (39·5° C.). It is composed almost entirely of *Stearin* with a little *Olein*, the more liquid constituent.

Prepared suet is used in preparing *Emplastrum Cantharidis* and *Unguentum Hydrargyri.*

Therapeutics.—This substance is emollient, and is occasionally added to poultices.

Gelatinum.—GELATINE.—This substance is the air-dried product of the action of boiling water on the gelatigenous animal tissues, such as skin, tendons, ligaments, and bones.

Characters.—Occurs in translucent sheets or shreds. The solution in hot water is colourless and inodorous, and solidifies to a jelly on cooling. Gelatine is insoluble in alcohol and ether. It dissolves in acetic acid. Its aqueous solution is not precipitated by diluted acids, alum, acetate of lead, or perchloride of iron ; it is precipitated by tannin.

Gelatine is used in the preparation of the *Suppositoria Glycerini.*

CLASS. AVES (BIRDS).

Rasores (Gallinæ).

GALLUS BANCKIVA OR DOMESTICUS. THE COMMON FOWL (COCK AND HEN).

Ovi Albumen.—EGG ALBUMEN.—The LIQUID WHITE of the egg of Gallus Banckiva (fig. 385), or Gallus Domesticus.

FIG. 385.—Gallus Banckiva.

Characters. — Transparent, glairy and viscid, coagulated by boiling, and by the addition of ether, and also by corrosive sublimate.

Ovi Vitellus.—YOLK OF EGG.—The YOLK of the egg of Gallus Banckiva or Domesticus.

Characters.—Yellow, coagulated by heat, and yielding a fixed oil by expression. Consists of an albuminous principle, *Vitellin*, with olein, margarine, cholesterine, salts of iron, and calcium.

Yolk of egg is used in preparing *Mistura Spiritus Vini Gallici*.

Therapeutics.—Albumen is used as an antidote in poisoning by corrosive sublimate and sulphate of copper, in each case forming an inert albuminate of the metal. An astringent application may be formed by dissolving alum in white of egg. The albumen coagulates and is applied locally in this form. Yolk of egg forms a nutritious light article of diet, and is useful in the form of egg-flip in exhausted conditions of the system, when solid food cannot be taken.

Class. PISCES (FISHES).

Teleostei (Anacanthini).

1.—ACIPENSER. THE STURGEON.

Isinglass (Ichthyocolla). — Isinglass. — The swimming bladder or sound (prepared and cut into fine shreds) of various species of Sturgeon, Acipenser, or Sturio (figs. 386, 387). The best qualities are imported from the rivers of Russia flow-

Fig. 386. – The Great Sturgeon.

Fig. 387.—Acipenser Sturio.

ing into the Black and Caspian Seas, as also from the Sea of Aral, and the Lake of Baikal. Isinglass is also imported from Brazil and likewise from India.

Characters.—This is a gelatinous tissue, which, when boiled, yields gelatine, a substance soluble in hot water, and forming

a jelly on cooling ; it is precipitated by tannic acid, but not by gallic acid. Tanno-gelatine forms the basis of leather, and is produced by the union of tannic acid with gelatine.

FIG. 388.—False Isinglass from Para (natural size).

Official Preparation.—Solution of Isinglass.—(Isinglass, in shreds, and warm distilled water).

Used to distinguish tannic from gallic acid, with the former of which it yields a yellowish-white precipitate.

Para Isinglass.—This so-called Isinglass consists of bundles of ova of the shape and size in fig. 388. This substance is neither the swimming bladder of a fish nor is it gelatinous. It is of an albuminous nature, and is derived from the ovaries of the *Silurus Parkerii*, a fish about 3 feet long, weighing 20 pounds, and very abundant in the rivers of Guiana.

2.—GADUS MORRHUA. THE COD.

Oleum Morrhuæ.—Cod-liver Oil.—The oil extracted from the fresh liver of the Cod, Gadus Morrhua (figs. 389, 390), by the application of a heat not exceeding 180° Fahr. (82·2° C.).

Fig. 389.—Gadus Morrhua.

The cod is found in large quantities on the English, French, Norwegian, and Icelandic coasts, but especially off Newfoundland.

The oil can be extracted from the livers by three different modes: (1) by exposure to the sun so that they may undergo a fermentative process; (2) by boiling them in water for some time; (3) by dividing the livers, and allowing the oil to drain slowly away from them.

Characters and Tests.—Pale-yellow, with a slight fishy odour, and bland fishy taste. A drop of sulphuric acid added to a few drops of the oil on a porcelain slab develops a violet

colour, which soon passes to a yellowish or brownish-red, the colour being due probably to the action of the acid upon the biliary principles contained in the oil.

Cod-liver oil contains olein, margarin, biliary principles (colouring matter and organic acids), sulphuric and phosphoric acids with salts of iron, magnesium and calcium, and a substance termed *Gaduin*; also traces of bromine and iodine.

Dose.—1 to 8 fluid drachms in water, milk, orange-wine, porter or ale, or made into an emulsion with lime-water and glycerine.

Therapeutics.—The exact manner in which cod-liver oil acts is still undetermined. Patients who have become emaciated from any cause, and whose blood is impoverished, frequently put on flesh during its administration; in some cases it appears to improve the richness of the blood. It frequently increases the weight, the increase exceeding many times the quantity of oil consumed. It has proved very valuable in the treatment of phthisis, scrofula, and low forms of rheumatic and other inflammation. In all probability it merely acts as an *oil*, but is superior to other oils since it is more readily assimilated. Cod-liver oil is largely employed in the treatment of phthisis and scrofula, in chronic rheumatism and neuralgia, in chronic skin diseases, and in cachectic conditions generally. It is occasionally rubbed into the surface with the object of obtaining its constitutional effects.

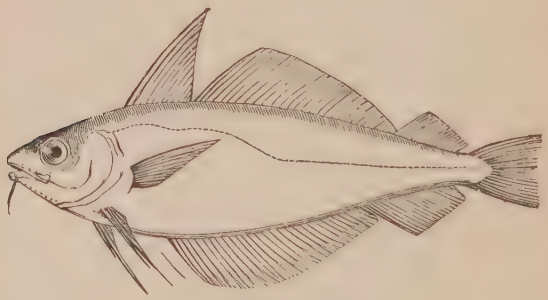


Fig. 390.—Gadus Morrhua.

Adulterations.—Numerous other oils have been mixed with the cod-liver oil. Other liver oils would be almost impossible to detect ; when, however, other oils, of other than hepatic origin, are present, they either will not yield with sulphuric acid the violet and red colours, or these colours instantly become mingled with and obscured by a dark brown substance, the oil becoming charred. These results take place when whale or seal oil or olive and other vegetable oils are present.

Class. INSECTA.

Coleoptera.

CANTHARIS VESICATORIA. THE SPANISH FLY.

Cantharis.—Cantharides.—The beetle Cantharis Vesicatoria (fig. 391) dried. The flies are collected in Sicily and Russia, but chiefly in Hungary.

Characters and Tests.—From about three quarters of an inch to an inch in length, and a quarter of an inch broad ; furnished with two long wing-sheaths *a*, *c* (elytra) of a shining

Fig. 391.—Cantharis Vesicatoria.
a, *c*, wing-sheaths (elytra) ; *b*, wing expanded.

coppery green colour, under which are two thin membranous transparent wings, *b* ; odour strong and disagreeable ; powder greyish-brown, containing shining green particles. Free from mites. The insects swarm upon trees (especially the privet, ash, and lilac) about May and June, and are collected by persons, carefully masked, brushing them off the branches

and catching them in sheets. They are then thrown into boiling vinegar and afterwards dried. They contain fatty principles and oil, yellow and green colouring matters, and an active principle *Cantharidine*. Figs. 392, 393 show the male and female organs of the Cantharis.

Official Preparations.—ACETUM CANTHARIDIS.—Vinegar of Cantharides (cantharides, bruised ; glacial acetic acid ; acetic acid. Prepared by digestion, percolation, and pressure).

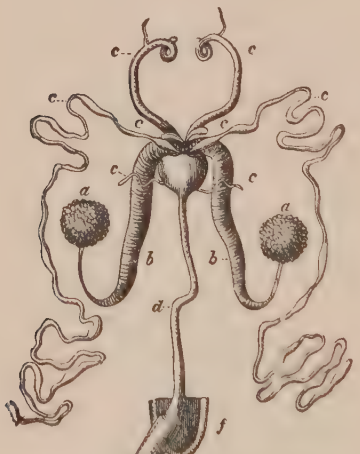


FIG. 392.—Male genital organs of Cantharis Vesicatoria.

a, *a*, testicles; *b*, *b*, vasa deferentia; *c c*, *c c*, *c c*, *c c*, the four pairs of vesiculæ seminales, or epididymoid vessels; *d*, the common spermatic tube; *e*, portion of the intestinal tube inverted; *f*, last abdominal ring.

FIG. 393.—Female organs of Cantharis Vesicatoria.

a, *a*, the ovaries covered by the egg-tubes: each ovary sends out an oviduct, *b*. The two ducts unite to form the common oviduct, which receives the excretory tube of the *spermatheca*, *c*, and other appendages, *d*, *d*; *e*, portion of the inverted intestine; *f*, last abdominal ring.

CHARTA EPISPASTICA. — Blistering Paper (white wax, spermaceti, olive oil, resin, Canada balsam, cantharides in powder, and distilled water). The ingredients, with the exception of the Canada balsam, are digested, stirred, and strained ; with the separated plaster, the Canada balsam is mixed and melted, strips of paper being passed over the hot liquid so that one surface of the paper becomes thinly coated.

Emplastrum Calefaciens. — Warming Plaster (cantharides, in coarse powder ; expressed oil of nutmeg ; yellow wax ; resin ; resin-plaster ; soap plaster ; boiling water)=1 in 3.

Emplastrum Cantharidis.—Cantharides Plaster (cantharides, in powder ; yellow wax ; prepared suet ; prepared lard ; resin)=1 in 24 nearly.

Liquor Epispasticus.—Blistering Liquid (cantharides, in powder, and acetic ether ; prepared by percolation) ; used in preparing Collodium Vesicans.

Tinctura Cantharidis.—Tincture of Cantharides (cantharides, in coarse powder, and proof spirit. Prepared by maceration and percolation).

Dose.—5 to 20 minims.

Unguentum Cantharidis. — Ointment of Cantharides (cantharides ; yellow wax ; olive oil).

Therapeutics.—Externally applied, cantharides is a rubefacient and irritant : if the preparation be strong, it produces vesication ; the active principle sometimes becomes absorbed, and symptoms similar to those resulting from its internal administration ensue. Internally, in medicinal doses, the first symptom is diuresis, and the urine, when examined, shows a trace of albumen ; under the microscope a few blood-discs may be discovered ; still further effects are strangury and hæmaturia, priapism, sometimes aphrodisiac effects, diminution and complete suppression of urine, and lastly convulsions and death. The drug has been supposed to influence the spinal cord. Externally, the preparations of the Spanish Fly are more universally employed than any other vesicating agents ; they are applied in pleurisy, pneumonia, pericarditis, and other internal inflammations, after the subsidence of the more urgent febrile symptoms ; also in cases of painful and diseased joints. Vesication is also employed in congestion of the head ; and over non-inflammatory painful parts, as in certain neuralgic affections ; finally, in diseased conditions of the skin itself. Internally, tincture of Cantharides may be administered in affections of the spinal cord, as in chronic forms of paraplegia, and incontinence of urine due to atony of the bladder. It has occasionally proved of service in hydro-

cephalus and in some non-inflammatory forms of albuminuria; also in skin affections, especially the squamæ; it has been sometimes employed in gleet and other mucous discharges.

The preparations of Cantharides must be omitted or used with caution in certain conditions as follows:—

In acute inflammation of the kidneys, since the cantharidine may become absorbed.

In young and very weak subjects vesication is liable to be followed by sloughing, and may prove dangerous.

In children, even when healthy, great caution must be observed in applying cantharides liniments to large surfaces; severe hæmaturia has resulted, and continued for several days, from the application of the Liquor Epispasticus to the scalp in the treatment of ringworm.

Adulterations.—A beetle termed the "Golden Beetle" has been mixed with cantharides; and to increase the weight, glass beads, coloured in imitation of the fly, have been added. It is said that flies deprived of their virtues by ether have been sold as genuine, and also that the resin of Euphorbium has been used for the adulteration of powdered cantharides.

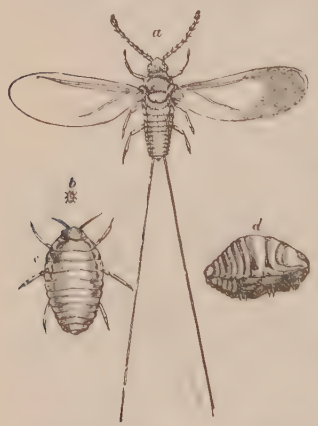


FIG. 304.—Coccus Cacti. Cochineal Insects (male and female).

a, male, with the wings expanded; *b*, adult female (natural size); *c*, adult female (magnified); *d*, impregnated female (natural size).

Hemiptera.

COCCUS CACTI. THE FEMALE COCHINEAL INSECT.

Coccus.—COCHINEAL.—The dried female insect, Coccus Cacti (fig. 394). Reared on Opuntia Cochinillifera (fig. 395), the Nopal plant, and on other species of Opuntia, in Mexico and Teneriffe.

Characters.—About one-fifth of an inch in length, outline somewhat oval, concave or flat beneath, convex above, wrinkled

Fig. 395.—Coccus Cacti and Opuntia Cochinillifera.

transversely, purplish-grey or purplish-black. Yields, when crushed, a dark red or puce-coloured powder. The female insects only are preserved ; they are brushed off into bags and killed by immersion in hot water. The purplish-grey variety consists of the impregnated female just before she has hatched her eggs ; the purplish-black, after she has laid and hatched her eggs. The grey insect quickly becomes black when warmed before the fire.

Cochineal consists of salts, fatty matters, and a peculiar colouring matter termed *Carmine* or *Carminic acid*, which occurs as small purple-red grains, soluble in water and in alcohol, and but sparingly so in ether.

Official Preparation.—TINCTURA COCCI.—Tincture of Cochineal (cochineal, in powder, and proof spirit. Prepared by maceration).

Dose.—30 minims to 1½ fluid drachms.

Cochineal, in powder, is also contained in *Tinctura Cardamomi Composita* and *Tinctura Cinchonæ Composita.*

Therapeutics.—Cochineal was formerly much esteemed in the treatment of whooping-cough. It is chiefly employed as a colouring agent, and is much used in the arts as a dye.

Adulterations.—Inferior cochineal is occasionally covered with bone-black to give it a black colour ; at other times it is coated with some white powder, as talc, carbonate of lead, or sulphate of barium, in order to make it resemble the finer variety.

Hymenoptera.

APIS MELLIFICA. THE HIVE BEE.

Cera Flava.—YELLOW WAX.—Prepared from the HONEY-COMB of the Hive Bee, Apis Mellifica (fig. 396).

Characters.—Firm, breaking with a granular fracture, yellowish, having an agreeable honey-like odour. Not unctuous to the touch. Melts at 146° F. (63·3° C.). Entirely soluble in oil of turpentine.

Bees' Wax is separable into three portions by means of alcohol, viz. : *Cerotin* or *Cerotic acid* soluble in boiling alcohol,

but deposited on cooling, *Myricin* or *Palmitate of Melissyl*, almost insoluble in boiling alcohol, and *Cerolein*, a substance which remains in solution in cold alcohol, and to which the tenacity, odour, and colour of the wax are due.

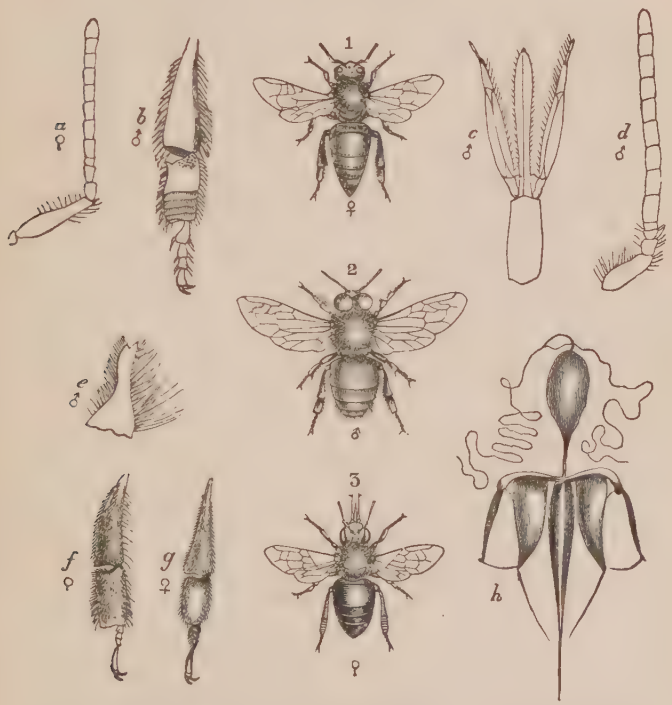


Fig. 396.—1, Apis Mellifica, female. 2, the same, male. 3, the same, neuter.

a, antenna, female; *b*, hind leg, male; *c*, tongue of male; *d*, antenna, male; *e*, mandible, male; *f*, hind leg, neuter; *g*, hind leg, female; *h*, sting and venom glands.

Yellow wax is contained in the *Emplastra: Cauefaciens; Cantharidis; Saponis Fuscum; Galbani; Picis;* and in *Unguenta: Cantharidis; Hydrargyri Compositum; Picis Liquidæ; Resinæ; Sabinæ; Terebinthinæ;* in *Pilula Phosphori*, and in the following :—

Cera Alba.—White Wax.—Yellow wax, bleached by exposure to moisture, air, and light.

Characters.—Hard, nearly white, translucent.

Official Preparation.—Unguentum Simplex.—Simple Ointment (white wax and prepared lard melted in almond oil, the mixture being stirred constantly while cooling).

White wax is also contained in *Charta Epispastica*, and in *Unguentum Cetacei* and *Unguentum Simplex.*

Therapeutics.—Wax is demulcent. It is employed chiefly for giving consistence to some official preparations.

Mel.—Honey.—A saccharine secretion deposited in the honeycomb by Apis Mellifica (fig. 396).

Characters and Tests.—When recently separated from the honeycomb, it is a viscid translucent liquid, of a light yellowish or brownish-yellow colour, which gradually becomes partially crystalline and opaque. It has a peculiar odour, and a very sweet characteristic taste. Should contain no starch. Consists chiefly of grape-sugar ($C_6H_{12}O_6$), mixed with odorous, colouring, gummy, and waxy matters and water.

Dose.—Ad libitum.

Official Preparations.—Mel Depuratum.—Clarified Honey (honey, melted in a water-bath, and strained while hot through flannel, having previously been moistened with warm water. Organic impurities are thus removed, and the honey is less liable to decomposition).

Honey is contained in the *Confectiones : Piperis ; Scammonii ; Terebinthinæ*, and in the following :—

Mel Boracis.—Honey of Borax (borax, in fine powder, glycerine and clarified honey, mixed).

Oxymel.—Oxymel (clarified honey, liquefied by heat and mixed with acetic acid and distilled water).

Dose.—1 to 2 fluid drachms.

Clarified honey is also contained in *Oxymel Scillæ.*

Therapeutics.—Honey is much the same as sugar in its action, but more laxative. It is usually employed as a vehicle for other medicines.

CLASS. ANNELIDA.

Hirudinea.

1.—SANGUISUGA MEDICINALIS. THE SPECKLED LEECH.

2.—SANGUISUGA OFFICINALIS. THE GREEN LEECH.

Hirudo.—THE LEECH.—The Speckled Leech, Sanguisuga

FIG. 397.—Ventral surface of the Leech.
a, anterior disk; *b*, posterior disk; *c*, penis; *d*, vaginal orifice; *e*, stigmata.

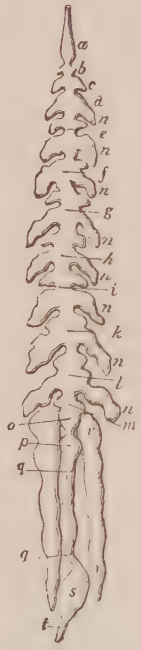


FIG. 398.—Alimentary canal of the Leech.
a, œsophagus; *b*, *c*, *d*, *e*, *f*, *g*, *h*, *i*, *k*, *l*, *m*, cells of the stomach; *n*, cæcal sacs; *o*, funnel-shaped pylorus; *p*, irregularly expanded commencement of (*q*) the small intestine; *r*, cæcal sac of the last cell of the stomach; *s*, large intestine; *t*, rectum.

Medicinalis; and the Green Leech, Sanguisuga Officinalis, collected in Spain, France, Italy, and Hungary.

Characters.—Body soft, smooth, two or more inches long, tapering to each end, plano-convex, wrinkled transversely; back olive-green, with six rusty-red longitudinal stripes.

The belly of the Speckled Leech is greenish-yellow, spotted with black; that of the Green Leech is olive-green, and is not spotted.

The anatomy of the leech is shown in figs. 398, 399.

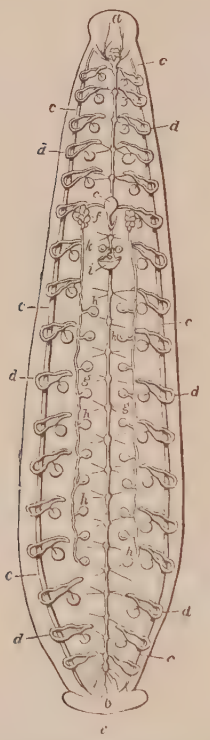
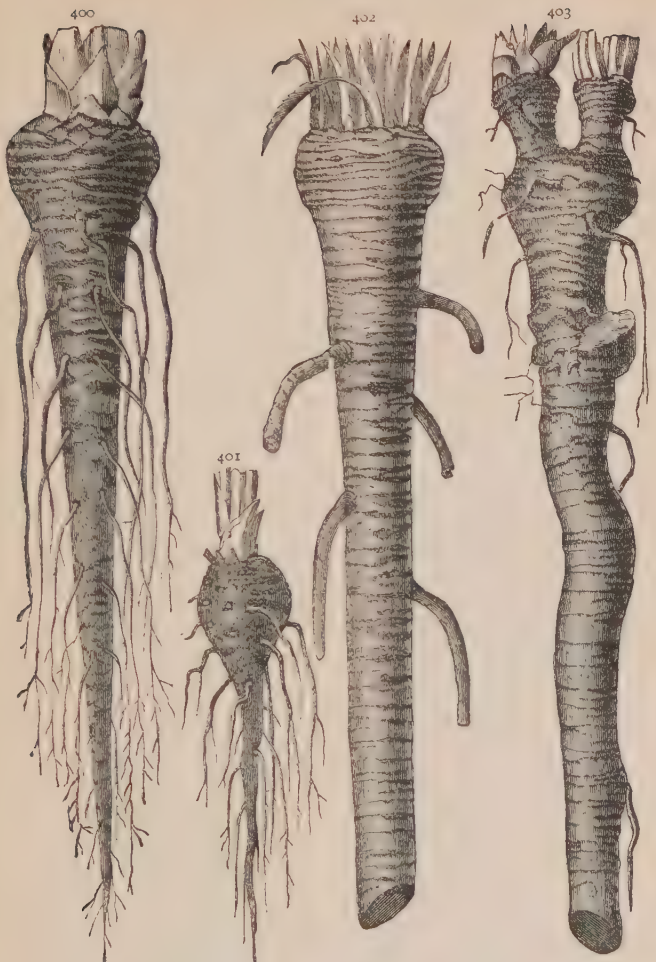


FIG 399.—Diagram illustrative of the internal anatomy of the Leech.

a, brain; *b*, last ganglion. Between these will be observed the chain of ganglia of which they form portions; *c*, lateral or branchial vessels; *d*, folded mucous glands: each is connected by a duct to an air vesicle; *e*, penis, the rounded enlarged base of which is supposed to contain the prostate gland; *f*, vesiculæ seminales; *g*, vasa deferentia; *h*, testicles; *i*, uterus; *k*, ovaries.

Therapeutics.—Employed for the abstraction of blood locally, when cupping is not advisable. A leech in general draws about one fluid drachm of blood. When a leech passes into the stomach, injections of salt and water must be immediately used; great care must be taken to prevent leeches entering the mouth, rectum, or uterus. Hæmorrhage from leech bites may be arrested by pressure, by application of caustic or collodion; sometimes a suture is necessary.



FIGS. 400 and 401.—Fresh Aconite Roots. (See page 214.)

Form. Conical and tapering perceptibly and rapidly to a fine point.
Colour. Coffee-coloured, or more or less distinctly earthy brown externally.
Odour. Merely earthy, or somewhat radish-like.
Taste. First slightly bitter, afterwards producing a peculiar tingling and numbness.

FIGS. 402 and 403.—Fresh Horse-radish Roots. (See page 188.)

Form. Slightly conical at its base or upper end, then cylindrical or nearly so, and almost of the same thickness for several inches.
Colour. Pale yellowish, or brownish white externally.
Odour. Especially developed upon scraping, when it is very pungent and irritating.
Taste. Very pungent and bitter or sweet, according to circumstances (Bentley).

FIG. 404.—A portion of a branch of Erythroxylon Coca, bearing leaves and flowers *a*, the leaf. (See page 191.)

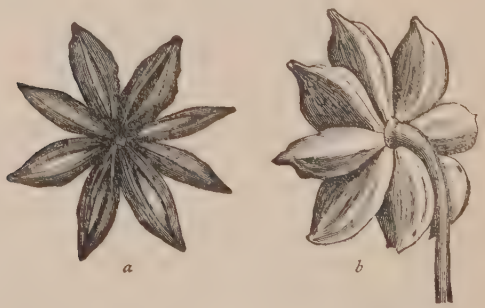


FIG. 405.—Star Anise Fruit. *a*, upper surface; *b*, lower surface with stalk attached. (See page 195.

FIG. 406.—Coscinium Fenestratum, known as Calumba wood. Transverse section of the stem. Belongs to the order Menispermaceæ, and is sometimes substituted for true Calumba, from which the slices are distinguished by their difference of structure, greater smoothness and hardness, and from not being contracted in the centre. (See page 198.)

FIG. 407.—Pareira Root. *a*, portion of a root; *b*, *c*, transverse section of roots. (See page 199.)

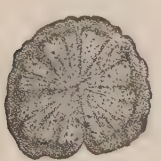


FIG. 408.—Cissampelos Pareira. transverse section of the stem. Sometimes substituted for the true Pareira root. (See page 199.)

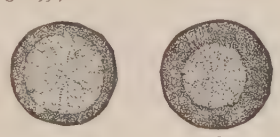


FIG. 409.—Peruvian Rhatany Root. *a*, transverse section; *b*, transverse section of Savanilla Rhatany Root. (See page 211.)

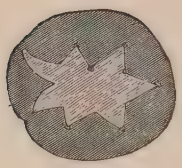


FIG. 410.—Transverse section of Aconite Root. Breaks with a short fracture, sometimes showing an irregularly stellate central axis or pith, with from six to eight rays, usually seven. (See page 214.)

FIG. 411.—Cimicifuga Racemosa. Transverse sections of, *a*, rhizome; *b*, rootlets. (See page 215.)

FIG. 412.—Stavesacre Seeds (magnified). *a a*, entire seeds; *b*, vertical section of a seed, showing nucleus consisting of a whitish albumen, and having a small straight embryo at one end. (See page 218.

FIG. 413.—Buchu Leaves. 1, leaf of Barosma Betulina; 2, 2, 2, leaves of Barosma Crenulata; 3, leaf of Barosma Serratifolia (all enlarged). (See page 219.)

FIG. 414.—Leaf of Empleurum Serrulatum. Frequently imported for leaf of Barosma Serratifolia, than which it is narrower, and usually longer. It has no lateral veins, and the margins are more closely serrate. The apex is acute; it has no oil glands and the odour is different. (See page 220.)

FIG. 415.—Pilocarpus Pennatifolius: under-surface of a leaflet. (See page 222.)

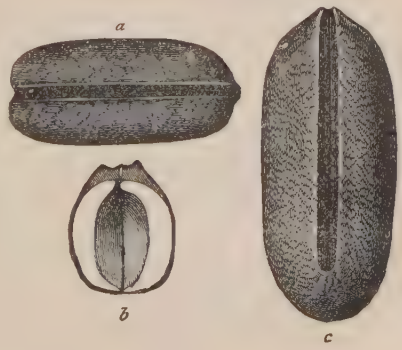


FIG. 416.—*a*, Physostigmatis Semen. Calabar Bean; *b*, transverse section of a seed, showing the somewhat large cavity by which the cotyledons are separated; *c*, seed of the Physostigma Cylindrosum, somewhat longer and more cylindrical than the former, the furrow not extending more than about three-quarters along the convex side of the seed. (See page 240.)

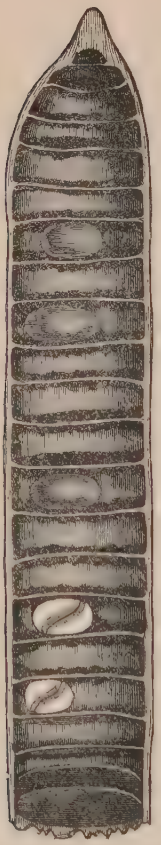


FIG. 417.—Cassia Fistula. Vertical section of a portion of the pod or fruit. (Iomentaceous legume), showing the transverse dissepiments by which it is divided into a corresponding number of cells, in each of which is a solitary seed surrounded by pulp. (See page 243.)

FIG. 418.—Peucedanum Graveolens. Dill Fruit. *a*, Dorsal surface of mericarp; *b*, mericarp (face or commissural surface); *c*, transverse section of a mericarp. (All enlarged.) Each mericarp is thin and flat, having three evident dorsal and two lateral ridges, expanding into a thin wing which surrounds the mericarp. On the face of each mericarp are two broad vittæ, and four at the back. (See page 268.)

FIG. 419. Pimpinella Anisum. Anise Fruit. A, entire fruit: *a a*, primary ridges; *b b*, channels; *g*, epigynous disk; *h*, pedicel. B, transverse section of the same: *a*, primary ridges; *b*, channels; *c*, vittæ; *d d*, albumen. (Both figures enlarged.) (See page 268.)

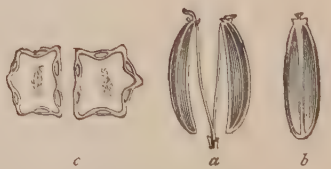


FIG. 420.—Carum Carui. Caraway Fruit. *a*, entire fruit, showing the two mericarps loosely attached to the central axis or carpophore; *b*, commissural surface of a mericarp; *c*, transverse section of the fruit, showing the vittæ. (All enlarged.) (See page 272.)

FIG. 421.—Hemlock Fruit. *a*, entire fruit; *b*, commissural surface of a mericarp; *c*, dorsal surface of a mericarp; *d*, transverse section of the fruit. (All enlarged.) (See page 273.)

FIG. 422.—Coriandri Fructus. Coriander Fruit. *a*, entire fruit, showing stylopod and styles; *b*, mericarp (dorsal surface); *c*, commissural surface of a mericarp; *d*, transverse section of the fruit. **(All enlarged.)** (See page 275.)

FIG. 423.—Fennel Fruit. *a*, entire fruit; *b*, mericarp (dorsal surface) *c*, mericarp (face or commissural surface), showing the five ridges; *d*, transverse section of a mericarp, showing vittæ. (All enlarged.) (See page 276.)

FIG. 424.—Belladonna Root, transverse section of, showing the thinnish cortical portion, separated by a dark line from the central woody portion, which is marked by scattered dark dots and shows medullary rays. (See page 280.)

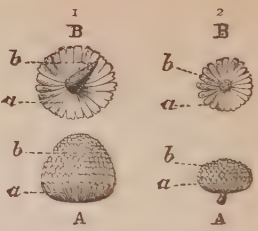


FIG. 425.—Anthemis Nobilis. 1 A, a flower-head with the florets removed, showing the involucre *a*, and scaly receptacle *b*. 1 B, a flower-head of the same with florets and scales (bractlets) removed, showing involucre *a*, and conical receptacle *b*. 2 A, a flower-head of Chrysanthemum Parthenium with the florets removed, showing the involucre *a*, and scaly receptacle *b*. 2 B, flower-head of the same with florets and scales removed, showing involucre *a*, and convex receptacle *b*. The flower-heads of this plant have, in rare cases, been mixed with the chamomile. (See page 307.)

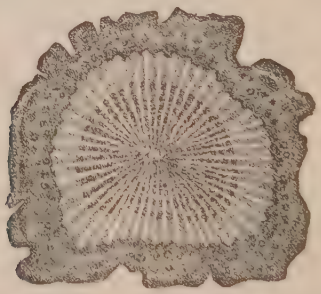


FIG. 426.—Pellitory Root, transverse section, magnified three diameters, showing the dark-coloured receptacles of resin and the large medullary rays. (See page 310.)

FIG. 427.—Taraxacum Officinale. *a*, portion of the *dried* root, showing the shrivelled and furrowed appearance; *b*, *c*, *d*, transverse sections of dried Dandelion Roots of different sizes, showing the concentric rings. (See page 312.)

FIG. 428.—Seed of Lobelia Inflata. These seeds are very minute and brown; $\frac{1}{50}$th in. long, and $\frac{1}{75}$th in. broad. Microscopically they are seen to be oval or almond-shaped, the surface being marked with longitudinal and transverse ridges and intervening spaces, producing a reticulated appearance resembling basket-work. (See page 325.)

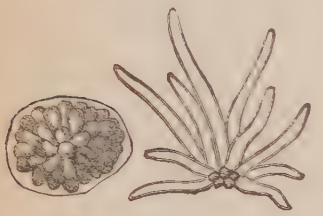


FIG. 429.—Kamala (magnified 190 diameters), showing the glands *a* (which are irregular, spherical, flattened or depressed, and garnet red with wavy surfaces); also the stellate hairs, greyish and thick-walled, *b*. (See page 367.)

FIG. 431.—Rheum Rhaponticum. Transverse section of a dried cylindrical piece of the root. This root has sometimes been substituted for the official China Rhubarb. It is lighter in weight, more or less spongy in the middle, more pink; the lines at the ends of the cylindrical pieces are more or less radiate, and on the flattened pieces somewhat parallel on the external surface. (See page 382.)

FIG. 430.—Piper Angustifolium. Matico Plant. Portion of the stem and under surface of the leaf. Oblong-lanceolate, tapering towards the apex, reticulated with sunken veins and tesselated above, veins prominent beneath. (See page 380.)

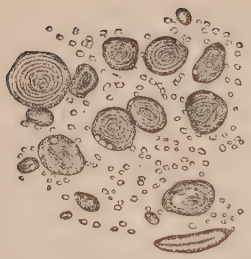


FIG. 432.—Wheat Starch (magnified 250 diameters). A mixture of small and large granules, lenticular in form, marked with faint concentric striæ, surrounding a nearly central hilum. (See page 388.)

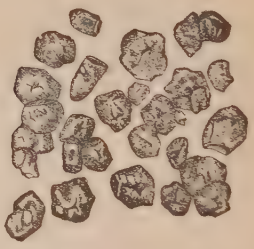


FIG. 433.—Maize Starch (magnified 250 diameters). Granules more uniform in size, somewhat smaller than the large granules of wheat starch, often polygonal, with very distinct hilum, but no evident concentric striæ. (See page 388.)

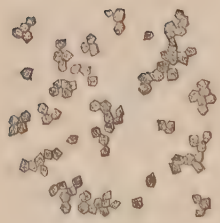


FIG. 434.—Rice Starch (magnified 250 diameters). Granules very minute, nearly uniform in size, polygonal; hilum small and no striæ. (See page 388.)

FIG. 435.—Crystals of Aloin (magnified) showing the tufts of acicular crystals. (See page 403.)

FIG. 436.—Crocus Sativus. *b*, upper part of the flower laid open to show the style and three stigmas; *a*, one of the stigmas, enlarged. (See page 399.)

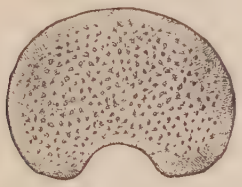


FIG. 437.—Colchicum Corm. Dried transverse slice as seen in pharmacies. The slices are moderately indented on one side, and convex on the other, so that when entire their outline is somewhat reniform (kidney-shaped). (See page 405.)

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